Objective: To examine and compare social acceptance, social behavior, and facial movements of children with and without oral clefts in an experimental setting.

Design: Two groups of children (with and without oral clefts) were videotaped in a structured social interaction with a peer confederate, when listening to emotional stories, and when told to pose specific facial expressions.

Participants: Twenty-four children and adolescents ages 7 to 16½ years with oral clefts were group matched for gender, grade, and socioeconomic status with 25 noncleft controls.

Main Outcome Measures: Specific social and facial behaviors coded from videotapes; Harter Self-Perception Profile, Social Acceptance subscale.

Results: Significant between-group differences were obtained. Children in the cleft group more often displayed “Tongue Out,” “Eye Contact,” “Mimicry,” and “Initiates Conversation.” For the cleft group, “Gaze Avoidance” was significantly negatively correlated with social acceptance scores. The groups were comparable in their ability to pose and spontaneously express facial emotion.

Conclusions: When comparing children with and without oral clefts in an experimental setting, with a relatively small sample size, behavior analysis identified some significant differences in patterns of social behavior but not in the ability to express facial emotion. Results suggest that many children with oral clefts may have relatively typical social development. However, for those who do have social competence deficits, systematic behavioral observation of atypical social responses may help individualize social skills interventions.

KEY WORDS: adolescents, children, facial action coding units, facial expression, oral clefts, social interaction
situations and responded with puppets and toys. Audiotape interviews were transcribed and coded for the number of social response strategies generated by each child, as well as each child’s degree of friendliness and assertiveness. Behavioral ratings of social behaviors by parents and teachers also were obtained with the Social Skills Questionnaire (Gresham and Elliot, 1990). The children’s facial expression encoding (Camaras et al., 1988) was assessed by instructing each child to rehearse and pose prototypic facial emotions (angry, surprised, disgusted, happy, sad, and afraid). Despite having lower attractiveness ratings and tending to be less friendly in social situations, the children with oral clefts did not have poorer self-perceptions. This study also found that two variables were significant predictors of social skills in children with oral clefts: (1) friendliness on the Enactive Social Knowledge Interview, and (2) performance on the facial encoding task. A recent follow-up study of a subgroup of these subjects (Kapp-Simon and Krueckeberg, 1997) confirmed that these same two variables continued to be associated with social competence in the primary grades. The authors hypothesized that the poorer ability to express emotions through facial expressions and less friendliness may combine to produce negative reactions from peers and therefore lead to greater social inhibition.

Congenital anatomic differences originating at the cellular level during embryogenesis as the pharyngeal arches join to form lips, palate, and mandible (Moore and Persaud, 1993) may restrict the normal range of facial expressions in children with oral clefts. Subtle facial muscle dysfunction also may result from surgical intervention to repair clefts. Children with oral clefts may appear less friendly or more interpersonally aggressive because their facial expression (as perceived by others) is incongruent with their true affective state. It has been noted that emotion can be communicated by relatively subtle changes in one or two discrete facial features. For example, tightening the lips may communicate anger, and the duration of a smile determines whether it expresses friendliness or hostility (Cohn et al., 1999).

In a recent study, Slifer et al. (2004) videotaped the social interaction patterns of 34 children ages 8 to 16 years with and without oral clefts while the children interacted with peer confederates. Oral cleft and control groups were compared regarding the occurrence or nonoccurrence of 16 different operationally defined social behaviors coded from videotapes. The occurrence of each behavioral response category was scored for every 10-second interval of the videotaped observations by using a partial-interval coding criterion. Percentages of intervals calculations were used to quantify the verbal and nonverbal social interactions occurring on the videotaped behavior samples.

Children with oral clefts made significantly fewer choices when the peer confederates offered and asked them to choose from different activity options (e.g., tabletop games such as Battleship, Connect Four, Uno) or conversation topics (e.g., home, school, recent events, activities with friends). The children also significantly more often failed to respond to direct peer questions (e.g., “Have you been to this clinic before?” “What kinds of things do you like to do for fun?” “Where do you go to school?”). Children with oral clefts and their parents both reported greater dissatisfaction with the children’s facial appearance, and parents of these children rated them as less socially competent. Children with oral clefts who felt more socially accepted looked a peer in the face significantly more often, whereas controls who felt more socially accepted chose an activity significantly less often during the social encounter.

On the basis of these results, it was concluded that differing patterns of overt social behavior could be measured among children with and without oral clefts and that such results may prove to be helpful in developing interventions to enhance social skills and adjustment for children with oral clefts experiencing social competence problems.

In another recent study, the facial emotion decoding and encoding skills and the perceived social acceptance self-ratings of children with and without oral clefts was also investigated (Slifer et al., 2003b). The primary objective was to replicate and further clarify some of the results reported by Kapp-Simon and Kreukeberg (1997), indicating significant differences between children with craniofacial anomalies and control group children in their ability to generate prototypic facial expressions. Global human judgments of color photographs of children’s facial expressions posed during a facial emotion encoding task were used in an attempt to replicate the results the authors obtained (Kapp-Simon and Kreukeberg, 1997). In addition, criteria defined by specific movements of facial features were used to measure the children’s facial expressions.

If previously reported differences in the responses of children with craniofacial defects could be precisely characterized in a group of children with isolated oral clefts, the results might lead to new assessment techniques for detecting subtle but clinically significant facial muscle dysfunction. Such results might guide the development of innovative behavioral interventions for training facial movements that are important for normative communication through facial expressions. Such intervention strategies could be tested in subsequent clinical studies.

Children ages 8 to 15 years with surgically repaired oral clefts (n = 19) and children who were noncleft controls (n = 19) viewed color video images of other children’s facial expressions and were asked to identify the emotion in each image. The participants also were videotaped while listening to a series of brief stories designed to evoke six basic emotions and when verbally prompted to pose prototypic facial expressions. They completed a self-report measure of their own perceived social acceptance. Judges who were blinded to experimental group and target emotion viewed the images, which had been systematically sampled from target intervals of the videotapes, and then recorded their subjective judgments of the emotion expressed in each. Trained coders also used operationally defined criteria to score the degree to which the images displayed specific facial movements. The results showed that children with oral clefts did not differ significantly from noncleft controls in their facial emotion decoding abilities (accuracy at identifying the facial expressions displayed by
other children). This replicated the findings of Kapp-Simon and Kreukeberg (1997). However, no between-group differences were obtained in the judges' global ratings of each participant’s ability to pose recognizable facial expressions.

By using the trained coders’ data on the occurrence of specific facial movements, differences were more often detected on the task that was designed to induce facial expression in response to emotional stories. Both groups were equally able to pose prototypic facial expressions when prompted. The one significant difference between group means was in the participants’ responses on the induced-surprise trials of the encoding task. Specifically, children with oral clefts were more likely to react to these trials with an expression that included an open mouth. This may have occurred because they were more sensitive or reactive to the content of the story presented or because they were anatomically or neurologically more prone to display an open mouth (e.g., because of lower resting muscle tone).

Children with oral clefts, but not control children who perceived themselves to be more socially accepted by others, more often posed a pronounced frown when prompted to show a sad face, perhaps indicating less social inhibition. Significant correlations between child-reported social acceptance and performance of specific facial movements also were detected on induced trials of the encoding task. For both oral cleft and control groups, children who reported greater social acceptance were less likely to react to story content designed to induce anger by raising the boss of their chins and compressing their lips. Children with oral clefts who reported greater social acceptance were less likely than were controls to scrunch their noses in response to either angry or disgusting emotional content presented verbally in a story. Children without oral clefts who reported better social acceptance were less likely to lower and draw together their eyebrows in response to angry story content. Given the high risk of making a type I error in a study that conducted multiple comparisons, future studies should use even more precise and reliable methods of measuring movements of the facial musculature when attempting to replicate these results.

As a step toward more precise and reliable measurement, the current study used the Facial Action Coding System (FACS) (DataFace, 2005) and FACS-certified coders to measure the participants’ facial emotion encoding from the original video images obtained by Slifer et al. (2003b). A second objective was to use other operationally defined social and facial responses not measured by Slifer et al. (2003a, 2004) to re-examine their videotapes of the participants’ social interactions. The goal was to compare children in the oral cleft group and the control group by using these additional measures and to assess the relationship of these data to the children’s self-ratings of social acceptance by others. It was hypothesized that children with oral clefts would show significantly different patterns of social and facial behavior than would controls on these additional measurements, and that children within the oral cleft group with poorer perceived social acceptance also would differ significantly relative to those who feel more socially accepted.

**Method**

**Participants and Setting**

Children and adolescents with and without oral clefts between the ages of 7 and 16½ years participated. These individuals made up two separate groups matched by grade, gender, and socioeconomic status (within the same class on the Hollingshead index of occupations). Exclusion criteria for this study were (1) the presence of a genetic syndrome with mental retardation, (2) hearing impairment that was moderate or severe in both ears, (3) severe speech impairment, or (4) receipt of full-time special education services. Children receiving part-time special education resources for specific cognitive or learning disabilities were included in this study because they spend the majority of their school day in regular classrooms and have ample opportunity for social interaction with typically developing peers. Furthermore, if learning disabilities and observable differences in social and facial behavior were found to be more common among children with oral clefts, this might provide preliminary evidence of a common etiological pathway for the cleft, the learning disability, and the observable differences in social and facial behavior. No significant difference was detected between the oral cleft group and the control group on the number of children receiving part-time special education services for cognitive or learning disabilities. Eight of the children in the oral cleft group were currently receiving part-time speech therapy. Access to the participating children was limited to a single session; therefore, time constraints precluded standardized IQ testing.

Children who were excluded because of moderate or severe hearing loss in both ears or because of severe speech impairment were identified by reviewing each potential subject’s clinical records. The following sources of information were used to confirm these impairments: multidisciplinary clinic notes; school speech, language, and audiology evaluations; clinic speech, language, and audiology evaluations; head and neck surgical evaluations; and direct consultation with the clinic’s speech and language pathologist.

Children with oral clefts were identified and recruited from the Cleft and Craniofacial Clinical Center at a major medical school–affiliated outpatient cleft and craniofacial clinic. Typically developing controls were recruited from the Baltimore metropolitan community by using advertisements approved by the institutional review board. Forty-nine children and adolescents participated. Twenty-four of the participants (9 boys) comprised the oral cleft group: 15 had cleft lip and palate, 6 had cleft palate only, and 3 had cleft lip only. The oral cleft group ranged in age from 7 to 16½ years (mean age 10.1, SD 2.5). The control group included 25 children (12 boys) with no known physical abnormality, ranging in age from 8 to 16 years (mean age 11.7, SD 2.5). A statistically significant difference was found between the groups for age ($t = -2.326$, $p < .05$), which was controlled for in the analyses. A total of 49 children and adolescents met the inclusion criteria for participation in the study; however, due to attrition, 47 out of 49 children completed the study (9 boys, 38 girls). Given the high risk of making a type I error in a study that conducted multiple comparisons, future studies should use even more precise and reliable methods of measuring movements of the facial musculature when attempting to replicate these results.
Dependent Measures

The Harter Self-Perception Profile for Children/Adolescents (Harter, 1985) is a standardized, 36-item, self-report questionnaire that measures self-perception across six subscales: (1) Social Competence, (2) Social Acceptance, (3) Athletic Competence, (4) Physical Appearance, (5) Behavioral Conduct, and (6) Global Self-Worth. The questionnaire completed by each participant is entitled What I Am Like and uses a structured alternative format in which a participant matches his or her own behavior to descriptions of other children. It is appropriate for use with children and adolescents between the ages of 8 and 18 years. The Social Acceptance subscale scores were used for this study.

Demographic Variables Questionnaire

The Four-Factor Index of Social Status (Hollingshead, unpublished data, 1975) was used to obtain information on education, occupation, gender, and marital status to estimate the socioeconomic status of each participant’s nuclear family. The Hollingshead rating is the most frequently used instrument for insuring that experimental groups are equivalent in terms of socioeconomic status.

Direct Observation of Social Interactions

Each participant was videotaped during a 10-minute analogue social interaction with a peer confederate who had been trained to respond in a positive but nondirective fashion. A trained adult research assistant supervised the interaction from a distance (similar to school playground or lunchroom supervision) but did not participate in the interaction except to ensure each participant’s comfort and safety. Videotaping occurred while the participant and peer confederate waited together in a designated clinic area equipped with a video camera on a tripod in plain view in the room. In addition to the video camera, this area also had a standard array of games appropriate across the age range of the study participants. The peer confederate was introduced as a student volunteer helping in the clinic that day who would spend some time getting to know the participant while he or she waited to see the doctor. During the 10-minute observation period, the peer confederate provided five standard bids for social interaction: (1) “Have you been to the clinic before?” (2) “Would you like to do something [gestures toward games] while we wait?” (3) “What kind of things do you like to do for fun?” (4) “Where do you go to school?” and (5) “Would you mind if we... [suggests activity change]?” Otherwise, the peer confederate simply responded in a forthright but brief manner to the participant’s questions and provided brief positive social reinforcement for any appropriate behavior (e.g., “That’s good,” “I like that,” “O.K.,” “Me too”).

The participants’ behaviors were scored by a direct observational social interaction coding system similar to the one used by Slifer et al. (2004) and to those previously used by other investigators to study peer social interactions in children with a variety of psychological or behavioral problems (Tremblay et al., 1981; Kern-Dunlap et al., 1992; Kern et al., 1995; Kapp-Simon and McGuire, 1997). These authors have published interobserver reliability percentages ranging from 75% to 96% and kappa coefficients averaging .79 (range .52–.93).

Development of Specific Behavioral Observation Definitions

In this study, three independent observers who were blinded to the experimental hypotheses were asked to view 10 social

$p < .02$) but not for gender, grade in school, marital status of parents, or socioeconomic status. A significant difference also was detected between groups for race ($\chi^2 = 8.330, p = .016$). The oral cleft group consisted of 22 individuals identifying as Caucasian, one identifying as African American, and one identifying as Hispanic. The control group consisted of 16 individuals identifying as Caucasian and nine identifying as African American.
interaction videotapes (five participants with oral clefts, five without) presented in random order. All three of these observers held a master’s degree in Child Clinical or Experimental Psychology. None of them had specific specialized training in children’s social behavior and peer relations other than that provided in their graduate school courses. Without any prior information given about the study or group membership, observers were instructed to record any notable social response, gesture, or movement of the head or face (particularly any that they thought to be unusual). This empirical and nontheoretical approach is a hallmark of applied behavior analysis, in which informal descriptive observations may be used to identify potentially important environmental and behavioral characteristics. These characteristics then are used to create operational definitions for subsequent systematic measurement of experimental variables. These measurements, if demonstrated to be reliable, ultimately are used along with the scientific method to demonstrate causal relationships between experimental variables (Cooper et al., 1987). We wanted to take a fresh look at the videotaped behavioral samples from Slifer et al. (2003a, 2003b, 2004), and we reasoned that any behavior that was salient enough to be recorded by an observer who was naive with respect to our research hypotheses might also stand out enough in social situations to prejudice a peer’s attributions about a child during a social interaction.

At the conclusion of the videotape review, 10 nonverbal behaviors and three verbal behaviors were selected for inclusion as behavioral categories in the formal coding of the videotapes for this study. These 13 responses were included based on the criterion that at least one of the three independent reviewers recorded it as a notable or socially unusual response. The operational definitions for these 13 behaviors are presented below:

### Nonverbal Behavior

- **Lips Parted/Mouth Open**—The lips are parted or mouth is open (e.g., while listening to the peer speak or while concentrating on a game or activity), excluding when the participant is speaking or laughing.
- **Tongue Out**—The tongue protrudes past the lips, except while speaking or laughing.
- **Touching Face**—Any part of the face is touched with the hand (e.g., stroking the chin, rubbing the nose, resting hand against cheek).
- **Eye Contact**—The participant directly meets the gaze of the peer during interaction.
- **Gaze Avoidance**—The participant averts his or her gaze, including looking away when the peer is looking at his or her face or is attempting to make eye contact (e.g., during conversation).
- **Furtive Glance**—The participant’s face and eyes are unequivocally directed toward the peer’s face while the peer is not looking at the participant (even if only instantaneously).
- **Mimicry**—The participant imitates the peer’s gestures or body behavior within the same or subsequent 10-second coding interval after the peer behavior.
- **Back-Channel Response**—The participant nods his or her head at the peer while the peer is talking or engages in other attending response, such as saying “yeah,” “uh-huh,” “right,” and so on.
- **Initiates Task Set-Up/Clean-Up**—The participant independently starts to physically set up or clean up activity without prompting, questioning, or being offered a choice by the peer.
- **Interrupts Turn**—The participant begins to move or take turns at the game before the peer is finished with his or her move or turn.

### Verbal Behavior

- **Self-Talk/Self-Couch**—The participant engages in “private speech” or self-talk during activity not directed toward the peer (e.g., narrating plays of game to self). Self-talk does not include speech about the game directed toward the peer.
- **Initiates Conversation**—The participant begins conversation with the peer or initiates change in conversation to a new topic.
- **Defers Choice**—When offered a choice of activity by the peer, the participant defers to peer (e.g., when asked “What do you want to do?” the participant replies by asking the same question or saying “I don’t care, it’s up to you” or “Whatever you want” and so on).

For each of the categories of behavior defined above, a percentage of observation intervals score was calculated for both the participant and the peer confederate by using a partial interval scoring criterion and the following formula: percentage of intervals = number of 10-second intervals with an occurrence coded, divided by the total number of 10-second intervals (e.g., typically 60), multiplied by 100.

Observer agreement data were obtained for the 10-second interval direct observations. Two coders independently scored the entire 10-minute videotaped observation for a randomly selected sample of 20% of all the videotaped observations conducted for this study. The mean percentage agreement was 93.3% (range 89.2%–97.6%, SD 2.5%). Kappa coefficients were also computed to assess observer agreement. Kappa values ranged from .59 to .99 across individual behavior categories, with a mean kappa for all observed behaviors of .86.

### FACS

After being videotaped while engaging in social interaction with a peer confederate, participants also were videotaped performing six different emotional expressions: angry, surprised, disgusted, happy, sad, and afraid. Expressions were obtained under either “induced” or “posed” experimental conditions. For the induced condition, participants were instructed to listen to six short audiotaped stories. Each story was designed to elicit one of the six emotions and the associated facial expres-
sions. Story scripts can be found in Appendix A. Specific words in designated phrases of each story were used to signal the beginning and end of the target intervals when an induced facial expression would be considered to have occurred. At the end of each story, participants were prompted to intentionally pose a facial expression of the target emotion being described in the story. The posed facial expressions were those made in response to the specific prompt “Please think of a time that you felt [emotion] about something and show me with your face how [emotion] you looked.” Participants were videotaped so that only their faces and necks were visible. They were instructed to look straight ahead and listen to the tape recording. Taping began when the first story commenced.

Two participants from each of the original experimental groups did not have usable images for the facial emotion encoding task because of video equipment malfunction or because the participant had moved out of the field of view of the video camera. Therefore, the analyses on facial expression data were conducted with a sample of 22 individuals for the oral cleft group and 23 individuals for the control group.

The investigators trained a research assistant to analyze the videotapes for the most pronounced facial expression (apex) produced during the target intervals. The apex of the expression was identified as the point during the target intervals at which facial movements were maximally discrepant from their appearance when at rest (neutral expression). Because most expressions lasted for more than one video frame, the first frame that marked the peak of the expression was identified as the image to be included in the analyses. If the participant made more than one expression during the vignette, the most pronounced expression was coded.

If the participant made no observable facial expression, the researcher selected for inclusion in analysis the first video frame that directly followed the completion of the target auditory signal in the story or the research assistant’s prompt to pose the facial expression. The images selected for inclusion in the analysis were captured as digital computer image files with a 640 × 480 uncompressed bitmap format. Each image was identified by a subject number and an alphabetical code for the experimental group and condition to which it belonged.

It was not possible for the research assistant who selected and captured the target images to be kept blinded to the participant’s experimental group membership because of the presence of minor facial dysmorphia and minor postsurgical scarring (often subtle but visible). The research assistant who selected and captured the images was, however, blinded to the specific hypotheses that would be tested and to the specific methods that would be used by other research assistants in a separate laboratory who subsequently conducted the FACS coding of the selected images.

The FACS-certified research staff who coded the images also were blinded to the experimental conditions and study hypotheses. Each individual image was coded to identify the specific, facial anatomy-referenced movements observed in the image. Each facial movement was identified with an action unit (AU) code number according to the FACS manual (DataFace, 2005).

All facial expression images were thus coded with the combination or “string” of AUs or AU combinations observed in each image. The AU or AU combinations defining the prototype facial expression for each of the six basic facial emotions were identified based on the FACS manual. Facial AU strings for the participants’ images were then compared with the facial expression prototypes taken from the FACS manual. The matching process was conducted both manually and by a computer-matching query to ensure accuracy. Expressions were classified into two categories: “match” and “does not match.” For an expression to qualify as a match, the facial AU string had to be an exact match with one of the prototypic expression strings for the target emotion. The data analyses conducted with FACS data, therefore, were based on comparison of the proportion of participants achieving a match for each facial expression across induced and posed conditions and across experimental groups. Appendix B includes examples of prototypic expression facial AU strings, as well as the facial muscle or facial movement that is associated with the AU.

RESULTS

Independent group t tests confirmed that the groups did not differ significantly on the variables of gender, grade, and socioeconomic status. However, the groups did differ significantly on the variable of age (t = −2.326, p < .05). The mean age was 10.1 years (SD 2.5) for the oral cleft group and 11.7 years (SD 2.5) for the control group. Therefore, preliminary analyses were conducted to test for the relationship between participant age and the primary dependent variables for this study.

When Pearson r correlation coefficients were calculated, age was significantly correlated with two of the direct observation measures: Furtive Glance (r = −.243, p = .045) and Back-Channel Response (r = .286, p = .022). Therefore, the between-groups differences for these two dependent variables were analyzed separately by analysis of covariance (ANCOVA) to control statistically for variance due to age by entering age into the ANCOVA as a covariate. The results indicated that after controlling for age effects, the differences between groups were not significant for either Furtive Glance (oral cleft = 19.5 [SD 10.9], control = 15.9 [12.4], F = 1.59, p = .107) or Back-Channel Response (oral cleft = 1.19 [1.68], control = 1.06 [2.14], F = .963, p = .333).

Although the groups did not differ significantly in their ratio of boys to girls, analysis of variance was conducted to assess for group by gender interaction effects on the primary dependent variables for this study. A significant main effect for gender, but not group, was obtained on the children’s Social Acceptance scores (F = 4.242, p < .05) and for percentage of intervals with Eye Contact (F = 6.333, p < .05). However, no significant gender-by-group-interaction effect was found for either of these dependent variables. Data for males and females were combined for all subsequent analyses because (1) the
TABLE 1  Mean Percentage (SD) and t Test Results for Social Behavior Observation

<table>
<thead>
<tr>
<th>Target Behavior</th>
<th>Oral Cleft</th>
<th>Control</th>
<th>t</th>
<th>Significance One Tailed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lips parted/mouth open</td>
<td>45.1 (34.4)</td>
<td>30.6 (27.7)</td>
<td>1.62</td>
<td>.055</td>
</tr>
<tr>
<td>Tongue out</td>
<td>8.9 (12.6)</td>
<td>4.16 (5.75)</td>
<td>1.69</td>
<td>.050*</td>
</tr>
<tr>
<td>Touching face</td>
<td>19.5 (17.8)</td>
<td>14.1 (11.4)</td>
<td>1.26</td>
<td>.107</td>
</tr>
<tr>
<td>Eye contact</td>
<td>25.4 (18.1)</td>
<td>17.2 (11.3)</td>
<td>1.89</td>
<td>.033*</td>
</tr>
<tr>
<td>Gaze avoidance</td>
<td>22.6 (14.2)</td>
<td>17.6 (11.6)</td>
<td>1.38</td>
<td>.086</td>
</tr>
<tr>
<td>Mimicry</td>
<td>1.80 (3.55)</td>
<td>0.464 (1.12)</td>
<td>1.77</td>
<td>.043*</td>
</tr>
<tr>
<td>Initiates task set-up/clean-up</td>
<td>0.425 (0.751)</td>
<td>0.272 (0.636)</td>
<td>0.77</td>
<td>.222</td>
</tr>
<tr>
<td>Interrupts turn</td>
<td>1.46 (3.16)</td>
<td>0.404 (0.875)</td>
<td>1.58</td>
<td>.062</td>
</tr>
<tr>
<td>Self-talk/self-coach</td>
<td>10.9 (13.4)</td>
<td>5.88 (7.88)</td>
<td>1.59</td>
<td>.059</td>
</tr>
<tr>
<td>Initiates conversation</td>
<td>8.05 (6.85)</td>
<td>4.41 (4.13)</td>
<td>2.24</td>
<td>.015*</td>
</tr>
<tr>
<td>Defers choice</td>
<td>0.841 (1.30)</td>
<td>0.472 (1.14)</td>
<td>1.05</td>
<td>.147</td>
</tr>
</tbody>
</table>

* p ≤ .05.

ratio of boys to girls did not differ significantly between groups, (2) there was no significant gender-by-group interaction effect, and (3) the study had limited power due to the relatively small sample size.

Table 1 displays the mean percentage of interval scores, standard deviations, and between-group t test results for the 11 behavioral categories coded from the videotapes that were not significantly correlated with age or analyzed in the ANCOVA discussed above. Significant differences (p < .05) were found for Tongue Out, Eye Contact, Mimicry, and Initiates Conversation.

The participants’ Social Acceptance subscale scores from the Harter Self-Perception Profile were not significantly correlated with participant age (r = .061, p = .328). Therefore, an independent samples t test also was used to test for significant differences between groups on the Social Acceptance subscale. The two groups did not differ significantly on this measure (oral cleft = 2.87 [1.01], control = 3.00 [1.813], t = −.473, p = .319).

Within-group Pearson r correlations were calculated between the participants’ Social Acceptance subscale scores on the Harter Self-Perception Profile and the percentage scores for each of the 13 direct observation categories. The results from this analysis are shown in Table 2. A significant negative correlation was found for the behavior Gaze Avoidance in the oral cleft group but not in the control group. Thus, when participants in the oral cleft group endorsed lower feelings of perceived social acceptance, the number of instances in which they avoided making eye contact with the peers tended to increase.

Pearson r correlations between participants’ age and the facial encoding task scores were examined, and no significant correlations were obtained for the number of facial expressions that matched the FACS prototype. Table 3 displays the number of participants in the oral cleft and control groups who matched the FACS expression for each emotion across posed and induced situations, respectively. Table 3 also presents the results of a chi-square test for significant differences between groups and across induced versus posed conditions. No statistically significant between-group differences were obtained in the frequency of matching the FACS prototype for either posed or induced expressions. Participants in both groups were significantly more successful when posing prototype facial expressions than when the facial expressions were induced by a short story (p < .005).

Finally, the ability to match prototype facial expressions was not correlated with the participants’ self-reported levels of social acceptance for either group.

TABLE 2  Pearson r Correlations Between Social Acceptance Scores on the Harter Self-Perception Profile and the 13 Directly Observed Social Responses

<table>
<thead>
<tr>
<th>Target Behavior</th>
<th>Oral Cleft</th>
<th>Control</th>
<th>Significance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lips parted/mouth open</td>
<td>−.071</td>
<td>.106</td>
<td></td>
</tr>
<tr>
<td>Tongue out</td>
<td>.119</td>
<td>.150</td>
<td></td>
</tr>
<tr>
<td>Touching face</td>
<td>.320</td>
<td>−.296</td>
<td></td>
</tr>
<tr>
<td>Eye contact</td>
<td>−.121</td>
<td>−.146</td>
<td></td>
</tr>
<tr>
<td>Gaze avoidance</td>
<td>−.570*</td>
<td>−.086</td>
<td></td>
</tr>
<tr>
<td>Furtive glance</td>
<td>.215</td>
<td>−.014</td>
<td></td>
</tr>
<tr>
<td>Mimicry</td>
<td>−.213</td>
<td>−.251</td>
<td></td>
</tr>
<tr>
<td>Bark channel response</td>
<td>−.052</td>
<td>−.094</td>
<td></td>
</tr>
<tr>
<td>Initiates task set-up/clean-up</td>
<td>.017</td>
<td>−.327</td>
<td></td>
</tr>
<tr>
<td>Interrupts turn</td>
<td>−.297</td>
<td>.059</td>
<td></td>
</tr>
<tr>
<td>Self-talk/self-coach</td>
<td>−.181</td>
<td>−.128</td>
<td></td>
</tr>
<tr>
<td>Initiates conversation</td>
<td>.021</td>
<td>−.225</td>
<td></td>
</tr>
<tr>
<td>Defers choice</td>
<td>.195</td>
<td>.254</td>
<td></td>
</tr>
</tbody>
</table>

* p < .01 (one tailed).
serviced social responses during interaction with a peer. Specifically, Furtive Glance was more likely in younger children and decreased with increasing age, whereas Back-Channel Response, such as head nodding when listening to the peer speak, tended to increase significantly with increasing age. Therefore, age effects on these two variables were subsequently controlled for by entering age in the analysis as a covariate to be controlled statistically when conducting between-group comparisons. With age effects thus taken into consideration, the two groups did not differ significantly on either Back-Channel Response or Furtive Glance.

The results of the between-group comparisons on the other dependent variables indicated that children with oral clefts differed significantly from their control counterparts on a number of observed social behaviors. Although the behavior is relatively infrequent in both groups, children with oral clefts were noted to let their tongue protrude beyond the lips significantly more often than were children in the control group. The occurrence of mimicry (imitating an expression, gesture, head movement, or position) was even more rare in both groups but was noted significantly more often among children with oral clefts. Furthermore, children with oral clefts initiated conversation and made eye contact more frequently than did children in the control group. One might hypothesize that the increase in Tongue Out occurred in the oral cleft group as a result of a measurable difference in neuromotor control or resting muscle tone. One can speculate that this may be a result of (1) the same developmental abnormality that produced the cleft, (2) an orthogonal neurodevelopmental abnormality, or (3) past surgical intervention. However, it is equally plausible that this is a normal variant that simply reflects intense effort at attending or concentrating on the social interaction by a child with a history of oral cleft. In fact, the other behaviors observed to occur significantly more frequently in children with oral clefts (Mimicry, Eye Contact, Initiates Conversation) are all prosocial behaviors, and at worst they may reflect a greater eagerness to participate and be accepted in a social interaction. The finding that some children with oral clefts are more likely to engage in certain prosocial behavior with greater frequency may represent a compensatory effort learned during early social interactions with peers.

The current findings are not consistent with previous research conducted on this topic of children with oral clefts. Previous studies have found that children with oral clefts tend to engage in more passive social behaviors, thus making them appear unfriendly or aloof to fellow peers (Kapp-Simon and McGuire, 1997). Previous literature has noted negative differences in social behavior in young adult women with oral clefts (21±30 years of age) during an interview, such as exhibiting fewer back-channel responses (i.e., nodding, saying “uh-huh”) and smiling less frequently than age-, gender-, and education-matched controls without craniofacial anomalies (Adachi et al., 2003).

The higher frequency of positive social behavior displayed by children with oral clefts in the present study may have been an artifact of the method used. For example, the social interaction videotaped in the present study was contrived in that the peer confederate was instructed to interact similarly with all children in the study. In the natural social environment, peers are free to avoid or curtail interaction with a nonpreferred partner. In the Kapp-Simon and McGuire (1997) study, children with and without craniofacial anomalies were observed unobtrusively in the natural setting of the children’s school cafeteria. Their results indicated that children with oral clefts were less likely to initiate conversation with peers and were more likely to not respond when approached than were the children without oral clefts. An important difference between the Kapp-Simon and McGuire (1997) study and the current study is the peers’ reactions toward children with oral cleft. In the current study, the peer confederates acted in a positive way toward children with and without oral cleft. In the Kapp-Simon and McGuire (1997) study, peers were less likely to approach children with oral clefts and less likely to respond when such children addressed them. This suggests that the authors’ finding might have been colored by the effect of peers’ reactions toward children with oral cleft. Unfortunately, because of the way their study was designed, it was not possible to statistically test this effect. The current study indicates that when given positive peer reactions, children with oral clefts were able to interact in a way that is similar to their noncleft peers. Unfortunately, the peer confederates were not asked to rate how likeable or fun the children with oral clefts were during the social interactions. Had they done so, we may have obtained evidence that the behavioral differences measured between the oral cleft group and the control group indeed affected peer perceptions.

<table>
<thead>
<tr>
<th>TABLE 3 Frequency of Expression Matches and χ² Values Across Posed and Induced Expression by Group</th>
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</thead>
<tbody>
<tr>
<td><strong>Group</strong></td>
</tr>
<tr>
<td><strong>χ²</strong></td>
</tr>
<tr>
<td><strong>p value</strong></td>
</tr>
</tbody>
</table>

* Difference significant at the .005 level.
** Difference significant at the .001 level.
Another factor to consider is that the results of these studies may have been affected by recruitment bias. It is possible that children approached in the Cleft and Craniofacial Clinical Center who declined participation were more socially avoidant than those children who agreed to participate. Such sample bias may have led to more socially appropriate behavior by the oral cleft sample we studied than is true for the population of children with oral clefts as a whole.

Although the present study does note some differences in children with oral clefts, these differences can be interpreted as positive efforts on the part of such children to engage their social partners. As such, these findings are consistent with previous findings that the similarities between children with oral clefts and children who are typically developing controls far outweigh any differences between them. This supports the fact that children with idiopathic oral clefts without significant developmental disabilities who have received early surgical and multidisciplinary intervention quite often develop normative social competence.

Within the oral cleft group, a significant inverse relationship was noted between the observed social behavior of Gaze Avoidance and the Social Acceptance subscale score on the Harter Self-Perception Profile. Participants who self-reported less social acceptance were more likely to avoid looking the peer confederates directly in the eyes during the videotaped social interaction. Avoiding eye contact with others may negatively affect a child’s success in social interactions, or feeling less socially accepted may cause some children with oral clefts to avoid making eye contact with peers. Eye contact and related ability to process information about eyes and eye-gaze direction in others is commonly regarded to be critical for successful social development (Farroni et al., 2002). It is possible that the relationship between gaze avoidance and low self-perception is cyclical, that is, those who do not make frequent eye contact may be less socially desirable and may be more likely to be ignored or avoided by peers. These responses from others may reinforce negative self-perception and lead to more gaze avoidance. Of course, no direction of causality can be inferred from correlations no matter how significant the direction in others is commonly regarded to be critical for successful social development (Farroni et al., 2002). It is possible that the relationship between gaze avoidance and low self-perception is cyclical, that is, those who do not make frequent eye contact may be less socially desirable and may be more likely to be ignored or avoided by peers. These responses from others may reinforce negative self-perception and lead to more gaze avoidance. Of course, no direction of causality can be inferred from correlations no matter how significant the relationship may be. In fact, it may be that gaze avoidance and social acceptance are both determined by some third variable such as social anxiety or a specific neurocognitive deficit.

Facial behavior between the participants in the oral cleft group and the control group did not differ significantly when analyzed for the ability to match specific prototypic expressions. Furthermore, the ability to match prototype facial expressions was not correlated with the participants’ self-reported levels of social acceptance for either group. These results did not replicate previous findings (Slifer et al., 2003b) in which significantly more children in the oral cleft group reacted with an open-mouth response to the surprise described in a story used in our induced facial emotion encoding task. This study also failed to replicate the finding that children with or without oral clefts who perceived themselves to be more socially accepted by others displayed less negative facial emotion (anger or disgust) in response to angry or disgusting story content.

On the other hand, significant results consistent with Slifer et al. (2003b) were obtained for both groups when the FACS data were analyzed across conditions (posed vs. induced). Both groups were significantly better at matching prototypic expressions when the research assistant directly prompted them to make a particular facial expression (posed condition) than when the expression occurred while listening to a story with emotional content (induced condition).

There were few exact matches to any specific expressions across both groups. One possible explanation for the low frequency of matching may be because little research has been done on children’s facial expressions. Therefore, the FACS units used to define prototypic facial expressions were developed primarily from studies conducted with adults. Normative data for children’s facial muscle movements and their developmental course are needed for the FACS system. Differences between children with and without oral clefts may be more apparent if a children’s developmental FACS system were created and used to define facial emotion prototypes.

In conclusion, the present study supported the hypothesis that significant differences exist in social interaction patterns between children with oral clefts and children without oral clefts. The differences measured were relatively few and rarely in the expected direction. It is unclear if more differences in social behaviors would have been present between the two groups had the study taken place in a natural setting where the peer was not instructed to interact with the child or if the study had been conducted with a larger sample size. More studies with larger sample sizes are needed. Individual subject matching for age, gender, grade, race, ethnicity, developmental status, and socioeconomic status should be used and may require collaborative studies by a number of institutions. Such studies should use direct or videotaped observations to document the amount and nature of social interaction differences between children with and without oral clefts when interacting in natural settings (e.g., after-school activities, playground, or other unstructured social situation with familiar peers). Observation in such settings would allow for measurement of the spontaneous social responses of children with oral clefts and their peers. This would make it possible to analyze both the time sequence and the interactive effects of the behavior of the child with an oral cleft on the behavior of typically developing peers and vice versa. Finally, future studies also should involve neuropsychological assessment of all subjects to relate any observed social skills deficits of children with oral clefts to differences in their neuropsychological profiles. This may help clarify whether or not social competence problems in these children are more likely the consequence of organically based neuropsychological differences than of the social reactions of others to the physical appearance of children with oral clefts.

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APPENDIX A

Angry
This boy has a new CD. It is by his most favorite band with the most recent and best songs ever. Most of the kids at school love the same group, but almost nobody has this disc yet. The boy got the disc as a present from his best friend. The boy just came home and caught his younger brother playing with the new CD. It is out of its case and the brother is drawing circles around it with magic markers. There are fingerprints, ink spots, and scratches all over it. It is ruined. Now the boy feels really angry at his brother. He is clenching his fists and jaw and is about to yell and take back his CD. Now, think of a time when something made you feel very angry like this boy and show me with your face how angry you looked.

Surprised
This girl was out walking around on a Saturday afternoon. She was just thinking about something that she and her friends were talking about after school one day. Just walking around and thinking. All of a sudden, she noticed a plain, white envelope on the ground. She picked it up. It had no writing on it anywhere. She looked inside and realized there were five hundred dollars inside. She can’t believe her eyes. Five hundred dollars from out of nowhere and no sign of the owner! The last thing in the world she expected today was to find this! She is feeling very surprised. Now, can you think of a time that something so unexpected happened to you? Please show me with your face just how surprised you looked.

Disgusted
This girl was at lunch in the school cafeteria. She was just eating a hamburger and french fries. She has a big mouth full of juicy hamburger with lots of catsup, and another kid came rushing by behind her trying to make it to the bathroom. The other kid just ate the same thing and started feeling really sick. While passing behind this girl, the kid threw up all over this girl’s back. The warm, wet vomit is running down inside the back of her sweater. She is feeling really disgusted, really grossed out. Her stomach is starting to churn and she feels like throwing up also as she forces down the already chewed food in her mouth. Think of a time when something really gross like that happened to you and you felt really disgusted. Now show me with your face just how disgusted you felt.

Happy
This girl has a new friend whom she has been seeing and talking with at school every couple of days. She feels happy whenever they see each other and especially if they talk about something that both of them like a lot. She has been wanting this new friend to come spend the afternoon together at the girl’s house one Saturday, but the girl has been afraid to ask. She’s afraid the new friend might not like her that much. But she just got really brave and asked the new friend to come over this Saturday afternoon and the friend said, “Sure, that would be really fun! I can’t wait.” The girl is feeling very happy and can’t stop smiling. Please think of something you really wanted to happen and then it did and you felt really happy. Now show me with your face just how happy you felt.

Sad
This boy has a dog. The dog has been with him for a long time. They have kind of grown up together. The dog lives in his house and sleeps on his bed. They are like best friends. Over the years, whenever the boy was feeling lonely and there were no friends around to do things with, he would go play with Flippie. The boy has taken Flippie to the veterinarian and just learned that Flippie is very sick and might die or have to be “put to sleep.” The boy is feeling very sad, doesn’t want Flippie to be sick, doesn’t want to have to have Flippie “put to sleep,” but doesn’t want Flippie to suffer either. The boy feels like crying and just wants to sit and hold Flippie. His eyes are full of tears, his throat feels like a knot, and it feels hard to take a deep breath. Please think of a time that you felt sad about something and show me with your face how sad you looked.

APPENDIX B

<table>
<thead>
<tr>
<th>Emotional Expression</th>
<th>Example Facial Action Units</th>
<th>Description of Muscles Movements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angry</td>
<td>4, 17, 23, 24</td>
<td>Eyebrows drawn medially and down; lips tightened; lips pressed together; skin of chin elevated</td>
</tr>
<tr>
<td>Surprised</td>
<td>1, 2, 5, 27</td>
<td>Inner corner of eyebrow raised; outer corner of eyebrow raised; eyes widened; mouth stretched open</td>
</tr>
<tr>
<td>Disgusted</td>
<td>4, 6, 9</td>
<td>Eyebrows are drawn medially and down; upper lip raised and inverted; superior part of the nasolabial furrow deepened; nostrils dilated by the medial slip of the muscle; cheeks raised, eyes narrowed</td>
</tr>
<tr>
<td>Happy</td>
<td>12, 25</td>
<td>Lips corners pulled up and laterally; lips parted</td>
</tr>
<tr>
<td>Sad</td>
<td>1, 4, 15, 17</td>
<td>Inner corner of eyebrow raised and drawn medially (pulled together); corner of the mouth pulled downward and inward; skin of chin elevated</td>
</tr>
<tr>
<td>Afraid</td>
<td>1, 4, 7, 20, 25</td>
<td>Lower eyelid raised and drawn medially; inner corner of eyebrow raised; eyebrows drawn medially; lip corners pulled back laterally; lips parted</td>
</tr>
</tbody>
</table>