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Presentation and validation of the DuckEES child and adolescent dynamic facial expressions stimulus set

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Abstract

The stimulus sets presently used to study emotion processing are primarily static pictures of individuals (primarily adults) making emotional facial expressions. However, the dynamic, stereotyped movements associated with emotional expressions contain rich information missing from static pictures, such as the difference between happiness and pride. We created a set of 1.1 s dynamic emotional facial stimuli representing boys and girls aged 8–18. A separate group of 36 individuals (mean [*M*] age = 19.5 years, standard deviation [SD] = 1.95, 13 male) chose the most appropriate emotion label for each video from a superset of 250 videos. Validity and reliability statistics were performed across all stimuli, which were then used to determine which stimuli should be included in the final stimulus set. We set a criterion for inclusion of 70% agreement with the modal response made for each video. The final stimulus set contains 142 videos of 36 actors (*M* age = 13.24 years, SD = 2.09, 14 male) making negative (disgust, embarrassment, fear, sadness), positive (happiness, pride), and neutral facial expressions. The percent correct among the final stimuli was high (median = 88.89%; *M* = 88.38%, SD = 7.74%), as was reliability (κ = 0.753).

KEYWORDS

children and adolescents, dynamic videos, emotional facial expressions, stimulus set

1 | INTRODUCTION

Socio-emotional processing is often investigated by measuring responses made by participants viewing emotional facial expressions. This has been used to index constructs such as emotional reactivity, facial expression recognition, and face processing (e.g. Blakemore, 2008; Hare et al., 2008; McClure, 2000). However, the stimulus sets presently used to study these and other related processes consist of static pictures of individuals (primarily adults) making emotional facial expressions. Dynamic stimuli, which more closely resemble how emotional expressions are viewed in the real world, may confer greater ecological validity, which would increase recognition and labeling performance compared to static pictures (Calvo, Avero, Fernandez-Martin, & Recio, 2016; Nelson & Russell, 2014), and confer additional benefits in other fields using these stimuli such as by eliciting more robust neural activity (Trautmann, Fehr, & Herrmann, 2009). Ecological validity may be further improved by including dynamic stimuli of children and adolescents in our stimulus batteries for use in laboratory studies. To address these needs, we developed and validated a set of dynamic stimuli of children and adolescents making emotional facial expressions.

Static photographs of actors portraying facial expressions of different emotions have been used to study emotion processing for decades. Several validated stimulus sets exist, beginning with classic 1970s black and white static photographs (Ekman & Friesen, 1976). More recently, these have been complemented by rotated (Mazurski & Bond, 1993), three-dimensional (Gur et al., 2002), computer-generated (Oosterhof & Todorov, 2009), and full color, ethnically-diverse (NimStim; Tottenham et al., 2009) static stimulus sets. In addition, several cross-cultural sets from Sweden (the Karolinska Directed Emotional Faces database; Lundqvist, Flykt, & Ohman, 1998), Japan (Japanese and Caucasian Facial Expressions of Emotion; JACFEE; Biehl et al., 1997), and China (Wang & Markham, 1999) have been created. These stimulus sets vary in other regards, including the number of emotional expressions included, inclusion of neutral or calm stimuli, digital quality, and number of pictures per condition (Egger et al., 2011). Furthermore, the primary measure of validity of these stimuli has been the degree of agreement between the images' *a priori* emotion designation and the raters' identification of emotion type (Egger et al., 2011); however, it may be more ecologically valid to instead use the modal emotion identification response of a group of raters to determine emotion designation.

Adult static emotional facial stimulus sets have been used extensively to study face and emotion processing in children, adolescents, and adults. Yet, it may be that individuals of all ages process emotional facial expressions made by children and adolescents differently than those made by adults. Therefore, while these stimulus sets allow us to examine emotion processing of adult faces, it is unclear whether we can confidently extend inferences to the viewing of emotional facial expressions made by younger participants using these stimuli. For example, studies using static pictures of adult, child, and infant faces showed that both adults and children are better at recognizing faces of people their own age than those of other age groups (Kuefner, Macchi Cassia, Picozzi, & Bricolo, 2008; Macchi Cassia, Pisacane, & Gava, 2012). These differences have not yet been investigated with regard to emotion processing. These results demonstrate that more work is needed in this area, with more and varied sets of stimuli. Several sets of static stimuli have been created to remedy this problem, including the Diagnostic Analysis of Non-verbal Accuracy (DANVA) Child Facial Expression scale (Nowicki & Duke, 1994), the Dartmouth Database of Children's Faces (Dalrymple, Gomez, & Duchaine, 2013), the National Institute of Mental Health Child Emotional Faces Picture Set (NIMH-ChEFS; Egger et al., 2011), and the Child Affective Facial Expression set (CAFE; LoBue & Thrasher, 2015). As mentioned earlier, the most common initial step in validating these new developmental stimulus sets is to obtain emotion ratings from trained adults (e.g. Dalrymple et al., 2013; Egger et al., 2011), followed by a separate evaluation from a developmental sample (e.g. Coffman et al. [2016] which validated the NIMH-ChEFS set in an adolescent population). Similarly, the validation of these stimuli with a set of adult raters will allow for future validation using a developmental sample of raters, in order to test the hypotheses regarding emotion recognition in children and adolescents.

While the extant static stimulus sets reviewed here have proven quite useful (for example, Tottenham et al. [2009] has over 1400 citations as of the writing of this manuscript), the parameters of these sets provide some constraints in their utility in studying emotion processing. First, the dynamic, stereotyped movements associated with emotional expressions contain rich information that is missing from static pictures. For example, the differentiation between happiness and pride can often be a subtle puff of the chest that can only be identified through dynamic stimuli. Indeed, even more fine-grained differences between types of prideful expressions can be identified using dynamic stimuli (Nelson & Russell, 2014). Second, dynamic stimuli more closely resemble those seen in the real world, which has been shown to improve affect identification, emotion judgment, and differentiation between genuine and fake expressions (Ambadar, Schooler, & Cohn, 2005; Bould, Morris, & Wink, 2008; Krumhuber, Kappas, & Manstead, 2013; Wehrle, Kaiser, Schmidt, & Scherer, 2000). Digital manipulation has been used to morph static photographs and computer-generated emotional faces between emotions so as to create the illusion that the emotions are being dynamically created (e.g. LaBar, Crupain, Voyvodic, & McCarthy, 2003; Oosterhof & Todorov, 2009), but these stimuli still differ quite significantly from how emotions are expressed in the real world. Lastly, few child and adolescent emotional expression stimulus sets exist. The four validated sets of such stimuli are limited to static pictures, cover widely varying age ranges, and none include pride as a positive expression. Research on the mechanisms underlying the processing of youth emotional facial expressions by individuals of all ages would benefit from a standardized set of dynamic facial emotion stimuli of children and adolescents. In the present project, we created and validated a set of 1.1-second stimuli of dynamic emotional facial expressions made by boys and girls aged 8–18 in the Eugene/Springfield, Oregon metropolitan area. This set is freely available to the scientific community for use. This paper describes the creation of this stimulus set, as well as the results of an initial evaluation of the stimuli based on the scoring of 36 healthy late adolescent and young adult raters.

2 | METHODS

2.1 | Stimulus set development

The present stimulus set, named The University of Oregon (or, "Duck") Emotional Expression Stimulus (DuckEES) set, was developed in collaboration with the Lord Lebrick Theater Company in Eugene, Oregon, USA. All children and adolescents enrolled in Lord Lebrick's summer theater camp program were invited to participate in the stimulus creation process. After providing informed consent, interested actors were brought into a quiet room one at a time, and positioned in front of a video camera with a blank wall behind them. Each actor was asked to make expressions of disgust, embarrassment, fear, sadness, happiness, and pride, as well as a neutral expression. Similar to Dalrymple et al. (2013), actors were prompted to imagine themselves in situations that would elicit these emotions, and to express them to the best of their ability. After the session, the full video of each actor's session was reviewed and cropped into the 1.1-second clips that best portrayed a complete expression of each emotion. Specifically, the first (N.G.) and third (E.I.) authors viewed all films three to five times, and worked together to globally identify the best candidate emotional expression from each actor. The video was then edited so that the 1.1 second window contained the beginning, middle, and end of that expression.

This original stimulus set contained 250 videos of 37 child and adolescent actors (22 female, mean [*M*] = 13.24, standard deviation [SD] = 2.09, range 8–18 years, 89% Caucasian) each making expressions of disgust, embarrassment, fear, happiness, pride, sadness, and neutrality. Some of the child actors were unable to express some of the emotions, so those clips were not included in the set.

2.2 | Validation procedure

Following the validation procedures used by Tottenham et al. (2009), a separate group of 36 individuals from the University of Oregon (14 male, *M* age = 19.5 years, SD = 1.95, range 18–26 years) voluntarily participated in the validation of the stimuli for course credit. All participants provided informed consent in accordance with the University of Oregon Institutional Review Board, and did not provide information as to their mental or physical health. Adult raters are typically the population of choice used in initial validations for previous sets of child emotional face stimuli (e.g. Egger et al., 2011), as emotion identification abilities are still developing among children and adolescents (e.g. Thomas, De Bellis, Graham, & LaBar, 2007).

After providing informed consent, participants were seated in front of a computer and presented with each of the 250 video clips one at a time. On each trial, the video was presented with the emotion label choices ("disgust," "embarrassment," "fear," "sadness," "happiness", "pride," and "neutral"), as well as an option for "none of the above." Participants were asked to choose the most appropriate emotion label for each video from the set provided, and the task proceeded at the participants' own pace.

2.3 | Analysis methods

For all analyses, the correct label was defined as the most commonly chosen (modal) emotion label for that stimulus. Validity was measured by both mean and median percent correct for each stimulus. Reliability was calculated using Fleiss' kappa (Fleiss, 1971) to determine the agreement among the 36 raters, as well as among stimuli from each modally-labeled emotion and actor.

We first calculated validity and reliability across all 250 videos. We then followed the procedures used by previous stimulus development teams (e.g. Dalrymple et al., 2013; Tottenham et al., 2009), and set a threshold of 70% correct. This meant that only videos where 70% of subjects chose the modal emotion label were retained. Further, when there were two videos from the same actor included in the same group, the video congruent with the actor's intended emotion was selected. For example, when one actor made "happiness" and "pride" videos that were both modally labeled as "happiness," the one in which the actor intended to portray happiness was included and the one intended to portray pride was left out of this final subset. We then recalculated validity and reliability across the stimuli meeting those inclusion criteria, and present the final stimulus set. All analyses were conducted in R version 3.2.0 (R Code Team, 2013) using the IRR package (Gamer, Lemon, & Singh, 2012).

3 | RESULTS

From the original 250 stimuli, 35 videos were modally labeled to represent disgust, 29 embarrassment, 39 fear, 31 sadness, 46 happiness, 24 pride, 45 neutral, and 1 none of the above (see Supporting Information for one sample video for each emotion, as well as summary statistics for each video). The overall percent correct across all stimuli was acceptable (median = 77.78%; M = 74.0%, SD = 19.18%), and there was moderate agreement among raters (κ = 0.561). Validity and reliability statistics are summarized across the original and final stimulus sets in Table 1. Of the seven emotions included in this set, each actor made an average of 6.76 videos (SD = 0.64, range 4–7), and the lowest per-actor reliability was κ = 0.27.

A total of 149 stimuli surpassed the 70% agreement criteria for inclusion into the stimulus set. Of these, there were seven videos in which the same actor made two videos labeled identically (e.g. two modally labeled as "happiness"), and so were removed. As shown in Table 1, the percentage of stimuli removed varied significantly by emotion category (X^2 = 17.5, p = 0.013). The final set contained 142 videos: 20 disgust, nine embarrassment, 18 fear, 19 sadness, 34 happiness, 13 pride, and 29 neutral (see Figure 1 for still frames of exemplars from each category). An additional 16 stimuli were within 5% of the threshold: four disgust, three embarrassment, five fear, one sadness, two neutral, and one pride. In other words, a total of 158 stimuli surpass a more lenient agreement criteria of 65%.

The overall percent correct across all 142 stimuli was high (median = 88.89%; M = 88.38%, SD = 7.74%). Table 2 presents the confusion matrix for the labels chosen by participants for the final set of 142 stimuli, which represents the average percentage of correct and incorrect labels chosen for each expression. Because these stimuli were chosen because they surpassed the >70% agreement criterion, the overall percentage of correct labels chosen was high. Embarrassment was the least successfully labeled (81% correct), followed by pride and fear (85% each). The confusion matrix shows pride was most often miscatergorized as happiness (8%) and happiness as pride (5%), fear was most often miscategorized as disgust (6%), and neutral was most often miscategorized as sadness (5%). Lastly, the modal emotion selected by the raters was the same as the actors' intended expression for 141 of the final 142 stimuli (99.3%).

There was substantial agreement across all 36 raters for the final 142 videos (κ = 0.753). Fleiss's kappa was also high within each emotion category (disgust κ = 0.811; embarrassment κ = 0.609; fear κ = 0.741; sadness κ = 0.764; happiness κ = 0.828; pride κ = 0.713; neutral κ = 0.8). All of the original 36 actors had videos that were included in the final set of stimuli, ranging from one to six videos each (M = 3.84, SD = 1.26). Among these stimuli, the lowest per-actor reliability was κ = 0.541.

TABLE 1 Validity statistics by modal emotion chosen across the original set of 250 videos and final set of 142

	Original set (250)				Final set (142)		
Modal emotion	*N*	Median percent correct	Mean (SD) percent correct	Percentage removed	*N*	Median percent correct	Mean (SD) percent correct
Disgust	35	83.33	74.92 (21.36)	42.86	20	93.06	91.39 (7.37)
Embarrassment	29	58.33	61.88 (16.68)	68.97	9	77.78	80.86 (7.01)
Fear	39	69.44	69.73 (16.58)	53.85	18	86.11	85.19 (6.25)
Sadness	31	80.56	76.25 (18.41)	38.70	19	88.89	89.33 (7.54)
Neutral	45	83.33	77.59 (17.23)	35.55	29	88.89	88.41 (6.56)
Happiness	46	91.67	83.39 (16.06)	26.09	34	91.67	91.09 (6.93)
Pride	24	72.22	67.82 (22.23)	45.83	13	83.33	84.83 (10.18)

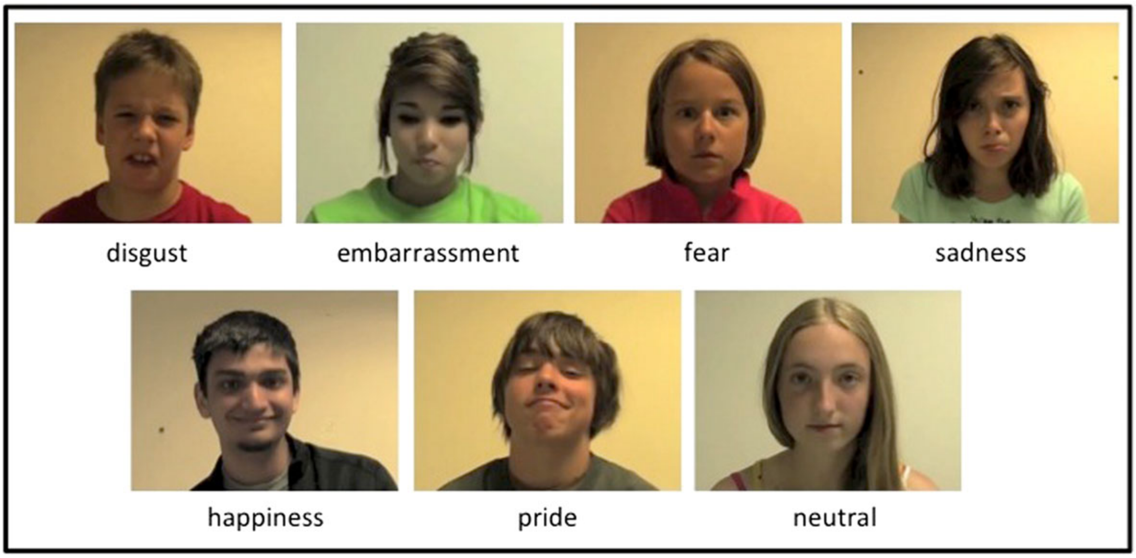

FIGURE 1 Still frames of exemplars from each emotion category

TABLE 2 Confusion matrix for the mean (SD) percent of subjects who endorsed each emotion label (agreement with modal emotion shown in bold) for the final set of 142 stimuli

Modal emotion	Label							
	Disgust	Embarrassment	Fear	Sadness	Neutral	Happiness	Pride	None
Disgust	**91.39(7.37)**	2.22(3.56)	1.53(2.62)	1.39(2.47)	0.42(1.36)	0.42(1.02)	0.00(0.00)	2.64(3.55)
Embarrassment	1.85(2.78)	**80.86(7.01)**	3.40(4.11)	3.70(4.39)	2.78(5.56)	0.62(1.22)	0.00(0.00)	6.79(5.03)
Fear	6.02(6.04)	3.42(3.33)	**85.19(6.25)**	1.08(1.69)	0.46(1.07)	0.31(0.90)	0.00(0.00)	3.70(3.16)
Sadness	2.05(4.71)	2.49(3.32)	1.75(3.37)	**88.60(9.21)**	3.22(7.07)	0.88(1.62)	0.00(0.00)	1.02(1.66)
Neutral	0.67(2.18)	1.15(1.74)	1.44(3.20)	4.69(5.10)	**88.41(6.56)**	1.53(2.30)	0.57(1.88)	1.53(1.75)
Happiness	0.00(0.00)	0.57(1.64)	0.49(1.07)	0.33(0.91)	1.39(2.58)	**91.09(6.93)**	5.23(6.18)	0.90(1.90)
Pride	0.64(1.22)	0.64(1.66)	0.00(0.00)	0.21(0.77)	2.78(4.94)	8.12(9.31)	**84.83(10.18)**	2.78(4.24)

4 | DISCUSSION

The purpose of this paper was to introduce a dynamic emotional facial stimulus set with adolescent actors, and present data describing the judgments of these stimuli by untrained, healthy adult raters. Both the full set of 250 stimuli and the 142 final stimuli are freely available to the scientific community online at http://dsn.uoregon.edu/research/duckees/, and may be a resource for scientists who study the development of emotion perception and processing.

In order to compare our results to those from other sets, we calculated validity using the percent correct, or the percentage of raters who agreed with the modal label chosen by the group. The percent correct across the final 142 stimuli was high (M = 88.38%), above the 70% criterion set by other stimulus sets. Indeed, our percent correct is quite similar to other similar stimulus sets, including the NimStim (79%; Tottenham et al., 2009), Ekman (88%; Ekman & Friesen, 1976), NIMH-ChEFS (75%; Egger et al., 2011), and JACFEE (74%; Biehl et al., 1997) sets. We also chose the response method to enable comparison with previous stimulus sets. This "semi-forced" choice response method presented each stimulus with all emotion labels along with an option for "none of the above." It is less strict than the "forced choice" response method, and also more interpretable than "free label" methods (Tottenham et al., 2009).

This stimulus set is unique for several reasons. First, it is the only set of dynamic videos representing emotion expressions made by adolescent actors. Compared to static pictures, these stimuli are more similar to how emotions are seen in the real world, which improves ecological validity. Further, the dynamic nature of these stimuli allows us to investigate differences between the perception and processing of social and non-social emotions (i.e. basic versus self-conscious emotions such as happiness versus pride) in developmental samples. Our participants were able to reliably discriminate between both types of positively valenced facial expressions, which indicates that these stimuli may be useful for studying positive affect discrimination. Second, we purposefully recorded our actors in their own clothing, not posed in standardized neck scarves or hair coverings. This has been done in other previously-validated batteries of static emotional stimuli (e.g. Batty & Taylor, 2003), but not dynamic stimulus sets. We believe that the combination of naturalistic and dynamic presentation significantly increases the ecological validity of these stimuli, and therefore increases the ability to assess emotion processing as it occurs in the real world.

The present study had several limitations. First, the majority of the actors were of Caucasian descent. While this reflects the ethnic makeup of the local area, future work should include a wider diversity of actors to increase generalizability. Second, while we believe the fact that the actors were wearing their own normal clothes, hairstyles, and jewelry increased the ecological validity of the stimuli, these may distract attention from the emotional content of the facial expressions. Third, relatively fewer stimuli from some of the emotion categories (e.g. embarrassment) were retained in the final set. This is most likely a property of the emotion; past facial displays of embarrassment created by actors have been identified with lower accuracy than those of the more basic emotions (e.g. Keltner, 1996). Fourth, we employed a semi-forced choice rating method in order to shorten the length of the experiment. However, rating each emotion label on a continuum for each stimulus may have provided a more fine-grained assessment of the expressions, especially for those stimuli that were commonly miscategorized as another emotion.

This stimulus set consists of dynamic emotional facial expressions made by children and adolescents ages 8–18. It was created to provide a battery of stimuli that untrained experimental participants could accurately identify, and is intended for use by researchers interested in studying the processing of these emotions. In order to provide initial validation of these stimuli, we employed raters who were age 18 and older. This was by design, as the use of adult raters is an accepted first step in validating developmental stimulus sets (e.g. Egger et al., 2011), which is commonly followed by a separate validation in a developmental population (e.g. Coffman et al., 2016). Because of the sample used to validate these stimuli, this set is ready to be used for an adult and developing adolescent population. It still needs to be validated for use with children; future work should test the validity of this set with a developmental population, as the identification of the emotional content of these dynamic stimuli may vary significantly by age. This stimulus set promises to be a valuable resource for researchers interested in the processing of emotional facial expressions made by children and adolescents.

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CONFLICT OF INTEREST

The authors have no competing interests.

REFERENCES

Ambadar, Z., Schooler, J. W., & Cohn, J. F. (2005). Deciphering the enigmatic face: The importance of facial dynamics in interpreting subtle facial expressions. *Psychological Science*, *16*, 403–410.

Batty, M., & Taylor, M. J. (2003). Early processing of the six basic facial emotional expressions. *Cognitive Brain Research*, *17*, 613–620.

Biehl, M., Matsumoto, D., Ekman, P., Hearn, V., Heider, K., Kudoh, T., Ton, V. (1997). Matsumoto and Ekman's Japanese and Caucasian Facial Expressions of Emotion (JACFEE): Reliability data and cross-national differences. *Journal of Nonverbal Behavior*, *21*, 3–21.

Blakemore, S.-J. (2008). The social brain in adolescence. *Nature Reviews. Neuroscience*, *9*, 267–277.

Bould, E., Morris, N., & Wink, B. (2008). Recognising subtle emotional expressions: The role of facial movements. *Cognition and Emotion*, *22*, 1569–1587.

Calvo, M. G., Avero, P., Fernandez-Martin, A., & Recio, G. (2016). Recognition thresholds for static and dynamic emotional faces. *Emotion*, *16*, 1186–1200. doi:10.1037/emo0000192

Coffman, M. C., Trubanova, A., Richey, J. A., White, S. W., Kim-Spoon, J., Ollendick, T. H., & Pine, D. S. (2016). Validation of the NIMH-ChEFS adolescent face stimulus set in an adolescent, parent, and health professional sample. *International Journal of Methods in Psychiatric Research*, *24*, 275–286.

Dalrymple, K. A., Gomez, J., & Duchaine, B. (2013). The Dartmouth Database of Children's Faces: Acquisition and validation of a new face stimulus set. *PloS One*, *8*, e79131.

Egger, H. L., Pine, D. S., Nelson, E., Leibenluft, E., Ernst, M., Towbin, K. E., & Angold, A. (2011). The NIMH Child Emotional Faces Picture Set (NIMH-ChEFS): A new set of children's facial emotion stimuli. *International Journal of Methods in Psychiatric Research*, *20*, 145–156.

Ekman, P., & Friesen, W. V. (1976). *Pictures of Facial Affect*. Palo Alto, CA: Consulting Psychologists Press.

Fleiss, J. L. (1971). Measuring nominal scale agreement among many raters. *Psychological Bulletin*, *76*, 378–382.

Gamer, M., Lemon, J., & Singh, I. F. P. (2012). *irr: Various coefficients of interrater reliability and agreement*, R package version 0.84. Vienna: R Foundation for Statistical Computing.

Gur, R. C., Sara, R., Hagendoorn, M., Marom, O., Hughett, P., Macy, L., & Gur, R. E. (2002). A method for obtaining 3-dimensional facial expressions and its standardization for use in neurocognitive studies. *Journal of Neuroscience Methods*, *115*, 137–143.

Hare, T. A., Tottenham, N., Galvan, A., Voss, H. U., Glover, G. H., & Casey, B. J. (2008). Biological substrates of emotional reactivity and regulation in adolescence during an emotional go-nogo task. *Biological Psychiatry*, *63*, 927–934.

Keltner, D. (1996). Evidence for the distinctiveness of embarrassment, shame, and guilt: A study of recalled antecedents and facial expressions of emotion. *Cognition and Emotion*, *10*, 155–172.

Krumhuber, E. G., Kappas, A., & Manstead, A. S. R. (2013). Effects of dynamic aspects of facial expressions: A review. *Emotion Review*, *5*, 41–46.

Kuefner, K., Macchi Cassia, V., Picozzi, M., & Bricolo, E. (2008). Do all kids look alike? Evidence for an other-age effect in adults. *Journal of Experimental Psychology: Human Perception and Performance*, *34*, 811–817.

LaBar, K. S., Crupain, M. J., Voyvodic, J. T., & McCarthy, G. (2003). Dynamic perception of facial affect and identity in the human brain. *Cerebral Cortex*, *13*, 1023–1033.

LoBue, V., & Thrasher, C. (2015). The Child Affective Facial Expression (CAFE) set: Validity and reliability from untrained adults. *Frontiers in Psychology*, *5*, 1532. doi:10.3389/fpsyg.2014.01532

Lundqvist, D., Flykt, A., & Ohman, A. (1998). *The Karolinska Directed Emotional Faces (KDEF)*. Stockholm: Department of Clinical Neuroscience, Psychology Section, Karolinska Institutet.

Macchi Cassia, V., Pisacane, A., & Gava, L. (2012). No own-age bias in 3-year-old children: More evidence for the role of early experience in building face-processing biases. *Journal of Experimental Child Psychology*, *113*, 372–382.

Mazurski, E. J., & Bond, N. W. (1993). A new series of slides depicting facial expressions of affect: A comparison with the pictures of facial affect series. *Australian Journal of Psychology*, *45*, 41–47.

McClure, E. B. (2000). A meta-analytic review of sex differences in facial expression processing and their development in infants, children, and adolescents. *Psychological Bulletin*, *126*, 424–453.

Nelson, N. L., & Russell, J. A. (2014). Dynamic facial expressions allow differentiation of displays intended to convey positive and hubristic pride. *Emotion*, *14*, 857–864.

Nowicki, S., & Duke, M. P. (1994). Individual differences in the nonverbal communication of affect: The Diagnostic Analysis of Nonverbal Accuracy Scale. *Journal of Nonverbal Behavior*, *18*, 9–35.

Oosterhof, N. N., & Todorov, A. (2009). Shared perceptual basis of emotional expressions and trustworthiness impressions from faces. *Emotion*, *9*, 128–133.

Code Team, R. (2013). *R: A language and environment for statistical computing*. Vienna: R Foundation for Statistical Computing.

Thomas, L., De Bellis, M. D., Graham, R., & LaBar, K. S. (2007). Development of emotional facial recognition in late childhood and adolescence. *Developmental Science*, *10*, 547–558.

Tottenham, N., Tanaka, J. W., Leon, A. C., McCarry, T., Nurse, M., Hare, T. A., & Nelson, C. (2009). The NimStim set of facial expressions: Judgments from untrained research participants. *Psychiatry Research*, *168*, 242–249.

Trautmann, S. A., Fehr, T., & Herrmann, M. (2009). Emotions in motion: Dynamic compared to static facial expressions of disgust and happiness reveal more widespread emotion-specific activations. *Brain Research*, *1284*, 100–115.

Wang, L., & Markham, R. (1999). The development of a series of photographs of Chinese facial expressions of emotion. *Journal of Cross-Cultural Psychology*, *30*(4), 397–410.

Wehrle, T., Kaiser, S., Schmidt, S., & Scherer, K. R. (2000). Studying the dynamics of emotional expression using synthesized facial muscle movements. *Journal of Personality and Social Psychology*, *78*, 105–119.

SUPPORTING INFORMATION

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