Ability emotional intelligence: What about recognition of emotion in voices?

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Abstract

Interpersonal emotion recognition requires the integration of nonverbal cues across a number of modalities (e.g., face/voice), but the 'gold-standard' measure of ability emotional intelligence (AEI) in youth (MSCEIT-YVR) is limited to assessment of facial emotion recognition. Using indices from signal detection theory, the current study examined whether scores on the MSCEIT-YV were associated with accuracy and response thresholds for recognizing vocally expressed anger, disgust, fear, happiness and sadness. Data from 122 adolescents (57.38% female) ages 11-18 years (M = 15.39) showed that young people who scored high on the MSCEIT-YV were no more accurate in recognizing vocal emotions, raising questions about whether the measure needs to be re-designed to include emotion recognition across modalities. Those scoring high on certain subscales of the MSCEIT-YV were less likely to choose anger as a response label, suggesting vocal expression recognition is linked to more complex emotion perception abilities. Findings are interpreted with reference to the influence of social context and early cognitive processing of vocalizations, with a recommendation that researchers revisit the specific skills that comprise emotion recognition in AEI measurement tools.

Keywords

Ability emotional intelligence; AEI; MSCEIT-YV; perceiving emotion; emotion perception; vocal emotion recognition; signal detection; adolescents; youth

1. Introduction

Emotionally intelligent individuals enjoy good mental health, and occupational and academic success (Mayer, Roberts, & Barsade, 2008). Those individuals score highly on maximal performance measures of emotional intelligence, such as the MSCEIT (Mayer, Salovey, & Caruso, 2002), STEM, and STEU (MacCann & Roberts, 2008), that assess skills in perceiving, understanding, using, and managing one's emotions and the emotions of others. In viewing EI as a form of intelligence, this ability emotional intelligence (AEI) perspective, is distinct from trait-based approaches, which measure perceptions of emotional competency and personality traits through self-report. Accurate labeling of emotions is conceptualized to be a foundational component of AEI, underpinning higher-order, strategic skills such as emotion understanding and management (Elfenbein & MacCann, 2017). In their revised model, Mayer, Salovey and Caruso (2016) posit that emotionally intelligent individuals are able to effectively perceive emotion in other people's verbal and non-verbal cues (e.g., facial or vocal expressions), and that those skills scaffold more complex emotion perception abilities (e.g., identifying deceptive or inaccurate emotional displays; understanding how context impacts expression). In other words, being able to accurately recognise and label emotions is an essential ingredient of AEI that facilitates adaptive social interactions.

There are, however, important distinctions in the skills required to infer emotionality from different types of non-verbal cues. For instance, although sufficient emotional information is present in a still image of a face to make judgments about the intended emotion of the encoder, vocal emotion embedded in prosody requires listeners to track dynamic acoustic information over time. Thus, accurate labeling of emotion expression in voices and faces tap different, modality-specific skills in emotion recognition (Castro, Cheng, Halberstadt, & Grühn, 2016; Schlegel, Boone, & Hall, 2017). Despite this, the most popular measures of AEI, the MSCEIT (for adults; Mayer et al. 2002) and the MSCEIT-YV (for adolescents; Mayer, Salovey, & Caruso, 2005), only measure a subset of those skills by asking respondents to label emotions in faces. That means current assessments of AEI may be limited in the information they can provide about a person's emotion recognition skills. Studies linking AEI to non-verbal emotion recognition in adults are rare, but suggest that there are differences according to cue type, with facial expression better recognized than vocal (e.g., Elfenbein, Jang, Sharma, & Sanchez-Burks, 2017). This has yet to be explored in young people. In the current study, we examine whether there is a need to consider the inclusion of other nonverbal modalities when assessing AEI, investigating whether scores on the MSCEIT-YV are associated with recognition of vocal emotion expressions.

1.1 AEI and recognition of non-verbal cues

Emotionally intelligent adults have a general preference for non-verbal information (facial/vocal tone) over verbal content, spending more time observing socially salient regions of interest, such as the eyes, mouth, head, and hands (Jacob et al., 2013; Roulin & Ternes, 2019). AEI also predicts attention to emotional vs. neutral cues under conditions of uncertainty or challenge (Elfenbein et al., 2017; Farrelly & Austin, 2007). Available data also highlight a moderate relationship between strategic emotion management and understanding skills and global emotion recognition accuracy in adults (MacCann, Pearce, & Roberts, 2011; Roberts et al., 2006; Thingujam, Laukka, & Elfenbein, 2012; c.f., DeBusk & Austin, 2011), but few studies have explored emotion-specific vocal recognition accuracy. Although social interaction involves multimodal integration of sensory information from various non-verbal channels (i.e., visual, auditory, tactile), the early processing of unimodal cues may differ across modality. For instance, emotional faces (presented as 'stills') tend to be recognized more quickly and with more precision than emotional voices, where the listener is required to integrate perceptual information over time (Schirmer & Adolphs, 2017). There is, therefore, a need for studies to examine links between AEI and the recognition of non-facial emotion to a) understand the generalizability of 'emotionally intelligent' emotion perception across modalities, and b) determine whether non-facial recognition tasks should be added to AEI assessments.

Existing evidence is further limited by an exclusive focus on adults. Cross-sectional data suggest that AEI increases with age during adolescence (Davis & Humphrey, 2012; Rivers et al., 2012), as do correct classifications of vocal emotional expressions (Grosbras, Ross, & Belin, 2018; Morningstar, Ly, Feldman, & Dirks, 2018). Developmental data confirming that scores on the MSCEIT-YV are linked to those capacities may shed light on why emotionally intelligent individuals experience better health and personal successes.

1.2 The current study

Literature examining whether AEI scores are associated with non-facial emotion recognition is sparse, and there are no data examining vocal emotion expression recognition using robust scoring procedures among youth. It is important to examine whether high levels of AEI correspond to superior perception of non-verbal emotional cues because AEI skills are now routinely trained in schools, despite a lag in the construct validation of AEI in young people (Davis & Wigelsworth, 2017; Pérez-González & Qualter, 2018). In particular, it is still unclear whether the leading omnibus measure of AEI (the MSCEIT) and its adaptation for youth (the MSCEIT-YV), which provides an index of capacity to identify *facial* emotions, also relates to skilled recognition of *vocal* emotion expressions – dimensions which are underpinned by distinct processing skills (Schirmer & Adolphs, 2017; Schlegel, Grandjean, & Scherer, 2012).

Understanding how AEI manifests as emotionally intelligent non-verbal perception across modalities can help uncover mechanisms through which AEI relates to social outcomes. In addition, findings can inform the debate about what specific skills comprise emotion recognition and emotion understanding (e.g., Castro et al., 2016), and whether we should be re-designing our measures to accurately assess those skills across modalities.

The current study explored whether AEI (using the MSCEIT-YV) was associated with vocal emotion recognition accuracy in young people. We computed indices of accuracy derived from signal detection theory, including a) discrimination accuracy (a measure of individuals' sensitivity to differences among emotion categories), and b) response threshold in the selection of emotional labels. These measures improve on extant computations of recognition performance by controlling for the effects of non-random guessing on identification, and evaluating the threshold for responses in decision-making (Goos & Silverman, 2002). In line with AEI theory, we predicted high levels of AEI (specifically, high levels of perceiving emotion) would relate to superior discrimination accuracy for emotion expression in voices, independent of age and sex effects. We made no a priori predictions about response thresholds owing to the lack of empirical data in this arena.

2. Method

2.1 Participants and Procedure

Participants were youth attending a Summer School at a university in the North West of England between 2015 and 2017 inclusive, where they completed a full day of research activities, taking part in a number of studies. Parental consent for the Summer School attendance was provided. A total of 122 youth (57.38% female; 94.57% of those attending the Summer School), ages 11 to 18 years old (M = 15.39 years old, *SD* = 1.77) consented to take part in the current study. The vocal ER task was presented first, followed by the MSCEIT-YV. Participants were debriefed about the exact aims of the study. University Research Ethics Boards approved all procedures.

2.2 Materials and Measures

2.2.1 Ability Emotional Intelligence (AEI)

The Mayer-Salovey-Caruso Emotional Intelligence Test-Youth Version (MSCEIT-YV; Mayer, Salovey, & Caruso, 2005) was used. The scale consists of 101 items (of which 97 are scored) that measure different aspects of AEI: 1) Perceiving emotions - individuals identify emotions in photographed facial expressions, 2) Facilitating emotions - participants rank, using a standardized scale, the extent to which different emotions impact behaviour and decision making, 3) Understanding emotions - includes vignettes and requires participants to select the answer representing what emotion a protagonist is feeling, 4) Managing emotions – participants read several scenarios and pick, from several options, the best solution for managing emotions in each scenario. The test distributor, Multi-Health Systems, scored the data using expert norms, providing means for each branch of the MSCEIT-YV and a total MSCEIT-YV score. Internal consistency scores of the MSCEIT-YV for the four branches ranged from a = .67 [Branch 1: perceiving emotion] to .86 [Branch 3: understanding emotions]; for the overall measure, a = .91.

2.2.2 Vocal Emotion Recognition Task

This comprised audio recordings produced in a previous study on emotional prosody (Morningstar, Dirks, & Huang, 2017). Actors spoke standardized-content sentences (e.g., "I didn't know about it", "Why did you do that?") in different emotional tones of voice. Participants heard

140 recordings of socio-emotional expressions (anger, disgust, fear, friendliness, happiness, meanness, and sadness) produced by adolescent and adult actors (7 expressions x 5 sentences x 2 speaker ages, spoken by both male and female actors). Recordings were selected from the full set of available stimuli based on judges' ratings of their recognizability and authenticity (see Morningstar et al., 2018 for more details). As opposed to standardized measures of nonverbal sensitivity, the use of these stimuli permits the assessment of listeners' decoding of emotional and social expressions produced by a large range of different speakers. Importantly, this task asks youth to identify emotion in stimuli produced by youth – as does the MSCEIT-YV. Previous work with this task (Morningstar et al., 2018) showed emotion-specific recognition patterns that are consistent with prior findings (e.g., anger and sadness are best recognized, and happiness and disgust are more poorly recognized; Johnstone & Scherer, 2000) and expected age-related increases in accuracy.

All 140 recordings were presented to listeners through headphones, in a randomized order, using E-Prime stimulus presentation software. Participants heard each recording twice in a row. They were then asked to select the speaker's intended expression from 7 labels (anger, disgust, fear, friendliness, happiness, meanness, sadness) by pressing labelled keys on a keyboard. Optional breaks were offered after every 50 recordings.

2.3 Analysis

2.3.1 Discrimination accuracy (P_r)

Representing sensitivity to differences among emotional categories (Pollak et al., 2000), P_r is computed as follows: [(number of hits + 0.5)/(number of targets +1)] – [(number of false alarms + 0.5)/(number of distractors + 1)]. Conceptually, P_r represents the correct responses minus the erroneous responses, accounting for the number of label options. P_r has values between -1 and 1: positive values represent greater correct responses than incorrect responses, and negative values represent greater incorrect responses than correct responses. Similar to d' (i.e., z(hits) – z(false alarms)), Pr is more appropriate when subjects' recognition accuracy is low (Snodgrass & Corwin, 1988) as is often the case in vocal ER tasks. Note that transformations are added in the above formula (i.e., +0.5) to prevent divisions by zero. One value of P_r was derived for each Emotion, resulting in 7 values per participant. Although P_r was computed considering all emotion categories included in the task (i.e., accounting for 7 response options), only P_r values for the 5 emotions represented in the MSCEIT-YV (anger, disgust, fear, happiness, sadness) were entered in analytical models. Given that the recognition of social expressions (e.g., friendliness, meanness) may elicit differential responses than basic emotions, this approach allowed a fair comparison of performance across tasks[1].

2.3.2 Response threshold (B_r)

B_r represents the amount of certainty a listener requires to select an emotional expression as a response (Pollak et al., 2000). B_r is computed as follows: [(number of false alarms + 0.5)/(number of distractors + 1)] / (1 - P_r). Conceptually, B_r represents a response threshold for selecting a particular emotion. B_r scores have values between 0 and 1: higher values of B_r represent a liberal or lax response criterion (meaning, participants require little evidence or a lower threshold of certainty before selecting this response); lower values of B_r represent a strict criterion for selecting that response (or, are more conservative in selecting this response). As with P_r,

[1] We opted to consider only comparable emotions in the vocal ER task, to match task difficulty (i.e. basic emotions vs. social/secondary emotions). We computed the general linear model specified in the main text using a 7-level factor for emotion type, type, for P_r and B_r, respectively. See supplemental material for results which were consistent with the 5-emotion model.

transformations are added in the above formula (i.e., +0.5) to prevent divisions by zero. As above, B_r was computed considering all emotion categories in the task (i.e., with 7 response choices), but only B_r for the 5 emotions represented in the MSCEIT -YV were entered in subsequent analyses.

2.3.3 Analytical model

A general linear model was performed to examine the effects of Emotion (within-subject variable, 5 levels: anger, disgust, fear, happiness, and sadness), mean-centered total MSCEIT-YV scores (between-subject variable; continuous), mean-centered age, and sex on P_r and B_r separately[2]. We included emotion type in our analytical model given that there are important differences in rates of recognition for different emotions: for instance, vocally-expressed anger and sadness are typically better identified than happiness and disgust (Johnstone & Scherer, 2000). This approach allowed us to account for differences in task difficulty across emotion categories[3]. Greenhouse-Geisser corrections were applied to analyses for B_r, as indicated by Mauchly's test of sphericity.

3. Results

Means and standard deviations for the study variables are provided in the *supplementary material*.

[2] As we were interested in examining how ability EI was associated with both accuracy and response thresholds, we opted to use both P_r and B_r rather than the unbiased hit rate (H_u; Wagner, 1993), which provides a composite score of performance/accuracy correcting for response bias. Results using H_u as the dependent variable were highly consistent with those obtained using *P*r (see Supplemental Materials).

[3] We also computed a model examining the association of mean-centered MSCEIT-YV total scores, mean-centered age, and sex with average P_r and B_r scores (averaged across all 5 emotion categories). MSCEIT-YV scores were not associated with average *P*r, but were associated with average B_r at trend level, $F(1, 118) = 3.38$, $p = .07$, $\eta^2 = .03$ (see Supplemental Materials for details).

3.1 Discrimination accuracy (P_r) in vocal emotion expression recognition

As shown in Table 1, there was a main effect of Emotion on P_r,: anger was best recognized, followed by sadness, fear, happiness, and disgust (all expressions significantly different from one another, *p*s < .01). There was also a main effect of sex, which was qualified by a sex and emotion interaction. Simple-effects tests revealed that females were more accurate than were males in their recognition of disgust, F (1, 120) = 6.97, $p < .01$, $\eta^2 = .06$, fear, F (1, 120) = 4.28, $p = .04$, $\eta^2 = .03$, and sadness, F (1, 120) = 7.84, $p < .01$, $\eta^2 = .06$. The interaction of Emotion and Age was also significant. Parameter estimates suggested that age was positively associated with P_r for Sadness, t (119) = 3.04, $\beta = .27$, $p = .003$, CI [.09, .44]. There was no effect or interaction pertaining to MSCEIT-YV score (*p*s > .29).

3.1.1 Response threshold (B_r) in vocal emotion expression recognition

There was a main effect of Emotion on B_r,: listeners were most liberal in their selection of sadness, followed by anger, disgust, fear (last three not different from one another, *p*s > .05), and happiness (unless otherwise specified, expressions were significantly different from one another; *p*s < .001). In other words, listeners were most likely to choose sadness, and least likely to choose happiness, when responding. There was also a trend towards a main effect of MSCEIT-YV scores on B_r (see figure in Supplemental Materials), driven primarily by B_r for anger, $\beta = -.21$, t (119) = -2.40, $p = .02$, CI [-.38, -.04]. Higher MSCEIT-YV scores were associated with a higher threshold for choosing anger as a response. In addition, there was a main effect of Age, which was qualified by an Emotion x Age interaction. Age was associated with lower thresholds for choosing sadness, t (119) = 2.81, $\beta = .25$, $p < .01$, CI [.07, .43], and anger at a marginal level, t(119) = 1.81, $\beta = .16$, $p = .07$, CI [-.02, .34]. There was a significant interaction between emotion and sex, with female listeners being more likely to choose sadness as a response compared to males, F (1, 120) = 7.78, $p <$ .01, $\eta^2 = .06$.

Table 1: Full factorial general linear model results

Effect	*df*	*F*	η^2	*P*
P_r				
MSCEIT-YV	1, 120	0.16	<.01	.69
Age	1, 120	1.53	.01	.22
Sex	1, 120	5.92	.05	.02
Emotion	4, 480	170.26	.59	<.001
Emotion x MSCEIT-YV	4, 480	1.26	.01	.29
Emotion x Age	4, 480	5.02	.04	.001
Emotion x Sex	4, 480	2.84	.02	.02
B_r				
MSCEIT-YV	1, 120	3.52	.03	.06
Age	1, 120	7.18	.06	<.01
Sex	1, 120	0.67	<.01	.42
Emotion	2.68, 321.22	39.27	.25	<.001
Emotion x MSCEIT-YV	2.68, 321.24	1.26	.01	.29
Emotion x Age	2.68, 321.24	4.66	.04	.01
Emotion x Sex	2.68, 321.24	5.12	.04	<.01

Note. η^2 = partial eta squared. MSCEIT-YV scores and Age were mean-centered predictors.

3.1.2 Partial correlations

To further understand the association between MSCEIT -YV scores and the response threshold for anger, we conducted partial correlations between B_r for Anger and mean-centered scores on each of the four branches of the MSCEIT-YV (controlling for age and sex). Results suggest that higher MSCEIT-YV Branch 1 scores (Perceiving Emotions) were significantly related to low B_r. values indicating a higher response threshold for anger, r (120) = -.18, p = .04. This pattern was marginally significant for Branch 4 scores (Managing Emotions), r (120) = -.17, p = .06. The other branches of the MSCEIT-YV were not associated with B_r for Anger (*p*s > .05).

4. Discussion

The current study examined whether scores on the MSCEIT-YV were associated with vocal emotion recognition skills in 11 to 18-year-olds. Contrary to theoretical predictions, adolescents with higher levels of AEI were no more likely to correctly recognise vocal expressions of happiness, anger, sadness, disgust, or fear than those with lower AEI. However, youth skilled in perceiving emotion, and to a lesser extent managing emotion, were more conservative in labeling vocal expressions as angry. Overall, the results of the current study highlight the importance of exploring the association between different components of AEI and the understanding of nonverbal expressions of emotions across different modalities. Although the detection of emotion expressions in people's voices is an important aspect of emotion recognition (Castro et al., 2016), it is currently absent from the MSCEIT, which is considered the 'gold standard' measure of AEI. While we found a small association between subscale scores from the MSCEIT-YV and response thresholds for anger, the absence of any other effects suggests there may be a need to re-evaluate the scope and measurement approach adopted by AEI tools (see e.g., Fiori et al., 2014) and particularly the field's reliance on mono-method testing.

4.1 AEI and expression recognition accuracy in young people

We did not establish a significant link between AEI and vocal emotion recognition accuracy in youth. We noted earlier that there is debate about whether current conceptualizations of the link between emotion recognition and emotion understanding are accurately reflected in our measurement tools (Castro et al., 2016). Our findings, together with data from adults showing MSCEIT scores were related to facial, but not vocal, emotion recognition accuracy (Elfenbein et al., 2017), or were only weakly correlated with vocal recognition scores (Roberts et al., 2006), suggest that there is a growing need for researchers to consider how emotion recognition works across nonverbal modalities and to integrate assessment of those skills into the current tests of emotional intelligence. Notably, scores from alternative AEI tools (i.e., STEM/STEU) have shown stronger associations with vocal rather than facial emotion recognition (MacCann et al., 2011). Those tools require test-takers to identify emotions from contextualized vignettes of socio-emotional situations, which may account for cross-measure discrepancies.

4.2 Why are young people with higher emotional skill less likely to label expressions as angry?

Mislabeling anger comes at a social cost (e.g., withdrawal and/or exclusion from a peer group) and has the potential to trigger enduring socio-emotional difficulties in young people (Trentacosta & Fine, 2010). Thus, it is quite reasonable that adolescents scoring higher on AEI need more information to be certain about labeling an emotional display as threatening, given possible social repercussions. First, it may be that young people with higher emotional skill are less likely to encounter anger in daily interactions, and so are less well-versed in judging a vocal expression as threatening (possessing fewer exemplars).

Second, it might also be the case that early attentional preferences in emotion detection differ according to AEI, which could impact conscious awareness and interpretation of threat. For example, adults with higher emotion management skill look away from briefly presented threatening faces, towards neutral expressions (Davis, 2018). This avoidant or ‘protective’ pattern of attentional processing is associated with interpretative biases in classifying ambiguous emotion as non-threatening (Derakshan, Eysenck, & Myers, 2007). Given the interplay between implicit processing of prosody and attention to emotional faces (Rigoulot & Pell, 2012) it will be important to consider the integration of emotion expression in different modalities into assessment tools, and consider how attentional (automatic and elaborative) processes underpin cross-modal integration of non-verbal cues in young people.

4.3 Limitations and Future Research

Because we aimed to examine isolated skill in vocal expression recognition, we used a test of decontextualized vocal expressions. That meant other non-verbal cues (facial and bodily expressions) were not accessible to support assessment. We know from previous work that emotionally intelligent adults spend longer observing others for non-verbal cues (Roulin & Ternes, 2019) and recognition may depend on dynamic contextual cues tied to the situation in which emotions manifest, particularly for ambiguous expressions (Barrett, Mesquita, & Gendron, 2011). Future studies should use multimodal presentations of emotion (e.g., GERT: Schlegel, Grandjean, & Scherer, 2014), combined with eye tracking, to explore the possibility that AEI influences the capacity to integrate numerous sources of information across modalities.

4.4 *Conclusions*

We sought to establish whether the most popular measure of AEI among youth, the MSCEIT-YV, was associated with superior ability to decode emotional vocalizations preadulthood, which could drive successful social interaction. Our data show that, in young people, higher scores on the MSCEIT-YV are not associated with discrimination accuracy of vocally expressed emotion. Instead, there is a small association between AEI and a more conservative response threshold for labelling vocal stimuli as angry. Emotionally intelligent, non-verbal emotion perception is likely nuanced, potentially acting at the level of early sensory and cognitive processing of vocalizations. However, these findings raise questions about what specific skills comprise emotion recognition, and about whether current AEI measurement tools adequately capture the full breadth of skills required for accurate interpretation of social cues. Thus, we extend the call made by Castro et al (2016) and suggest that the research community comes together to evaluate what aspects of emotion recognition we want to measure in our AEI measurements. Future work should build on the current findings by (1) examining attentional preferences for non-verbal cues, using multimodal emotional displays and neuropsychological methods, and (2) evaluating the current literature on emotion recognition and emotion understanding to develop a unified framework for those working in field of AEI.

References

Barrett, L. F., Mesquita, B., & Gendron, M. (2011). Context in Emotion Perception. *Current Directions in Psychological Science*, *20*(5), 286–290. https://doi.org/10.1177/0963721411422522

Castro, V. L., Cheng, Y., Halberstadt, A. G., & Grühn, D. (2016). EUReKA! A Conceptual Model of Emotion Understanding. *Emotion Review*, *8*(3), 258–268. https://doi.org/10.1177/1754073915580601

Davis, S. K. (2018). Emotional intelligence and attentional bias for threat-related emotion under stress. *Scandinavian Journal of Psychology*, *59*(3), 328–339. https://doi.org/10.1111/sjop.12439

Davis, S. K., & Humphrey, N. (2012). The influence of emotional intelligence (EI) on coping and mental health in adolescence: Divergent roles for trait and ability EI. *Journal of Adolescence*, *35*(5), 1369–1379. https://doi.org/10.1016/j.adolescence.2012.05.007

Davis, S. K., & Wigelsworth, M. (2017). Structural and Predictive Properties of the Emotional Quotient Inventory Youth Version – Short Form (EQ-i : YV [S]). *Journal of Personality Assessment*, *100*(2), 197–206. https://doi.org/10.1080/00223891.2017.1280502

Derakshan, N., Eysenck, M. W., & Myers, L. B. (2007). Emotional information processing in repressors: The vigilance-avoidance theory. *Cognition and Emotion*, *21*(8), 1585–1614. https://doi.org/10.1080/02699930701499857

Elfenbein, H. A., Jang, D., Sharma, S., & Sanchez-Burks, J. (2017). Validating emotional attention regulation as a component of emotional intelligence: A Stroop approach to individual differences in tuning in to and out of nonverbal cues. *Emotion*. American

Psychological Association. https://doi.org/10.1037/emo0000145

Elfenbein, H. A., & MacCann, C. (2017). A closer look at ability emotional intelligence (EI): What are its component parts, and how do they relate to each other? *Social and Personality Psychology Compass*, *11*(7). https://doi.org/10.1111/spc3.12324

Farrelly, D., & Austin, E. J. (2007). Ability EI as an intelligence? Associations of the MSCEIT with performance on emotion processing and social tasks and with cognitive ability. *Cognition & Emotion*, *21*(5), 1043–1063. Retrieved from http://www.informaworld.com/10.1080/02699930601069404

Fiori, M., Antonietti, J.-P., Mikolajczak, M., Luminet, O., Hansenne, M., & Rossier, J. (2014). What Is the Ability Emotional Intelligence Test (MSCEIT) Good for? An Evaluation Using Item Response Theory. *PLoS ONE*, *9*(6), e98827. https://doi.org/10.1371/journal.pone.0098827

Goos, L. M., & Silverman, I. (2002). Sex related factors in the perception of threatening facial expressions. *Journal of Nonverbal Behavior*, *26*(1), 27–41. https://doi.org/10.1023/A:1014418503754

Grosbras, M.-H., Ross, P. D., & Belin, P. (2018). Categorical emotion recognition from voice improves during childhood and adolescence. *Scientific Reports*, *8*(1), 14791. https://doi.org/10.1038/s41598-018-32868-3

Jacob, H., Kreifelts, B., Brück, C., Nizielski, S., Schütz, A., & Wildgruber, D. (2013). Nonverbal signals speak up: Association between perceptual nonverbal dominance and emotional intelligence. *Cognition & Emotion*, *27*(5), 783–799. https://doi.org/10.1080/02699931.2012.739999

Johnstone, T., & Scherer, K. R. (2000). Vocal communication of emotion. In M. Lewis & J. Haviland (Eds.), *Handbook of emotions* (pp. 220–235). New York: Guildford Press.

MacCann, C., Pearce, N., & Roberts, R. D. (2011). Emotional intelligence as assessed by situational judgment and emotion recognition tests: Building the Nomological net. *Psihologijske Teme*, *20*(3), 393–412. https://doi.org/10.1016/j.paid.2010.05.010

MacCann, C., & Roberts, R. D. (2008). New paradigms for assessing emotional intelligence: Theory and data. *Emotion*, *8*, 540–551.

Mayer, J. . D., Salovey, P., & Caruso, D. R. (2005). *The Mayer-Salovey-Caruso Emotional Intelligence Test – Youth Version (MSCEIT –YV). Research version*. Toronto, Canada: Multi-Health Systems.

Mayer, J. D., Caruso, D. R., & Salovey, P. (2016). The Ability Model of Emotional Intelligence: Principles and Updates. *Emotion Review*, *8*(4), 290–300. https://doi.org/10.1177/1754073916639667

Mayer, J. D., Roberts, R. D., & Barsade, S. G. (2008). Human abilities: Emotional intelligence. *Annual Review of Psychology*, *59*, 507–536.

Mayer, J. D., Salovey, P., & Caruso, D. R. (2002). *Mayer–Salovey–Caruso Emotional Intelligence Test (MSCEIT) users manual*. Toronto, Canada: Multi-Health Systems.

Morningstar, M., Dirks, M. A., & Huang, S. (2017). Vocal Cues Underlying Youth and Adult Portrayals of Socio-emotional Expressions. *Journal of Nonverbal Behavior*, *41*(2), 155–183. https://doi.org/10.1007/s10919-017-0250-7

Morningstar, M., Ly, V. Y., Feldman, L., & Dirks, M. A. (2018). Mid-Adolescents’ and Adults’

Recognition of Vocal Cues of Emotion and Social Intent: Differences by Expression and Speaker Age. *Journal of Nonverbal Behavior*, *42*(2), 237–251. https://doi.org/10.1007/s10919-018-0274-7

Pérez-González, J. C., & Qualter, P. (2018). Emotional intelligence and emotional education in the school years. In L. Dacre Pool & P. Qualter (Eds.), *An introduction to emotional intelligence* (pp. 81–104). London, UK: Wiley-Blackwell.

Pollak, S. D., Cicchetti, D., Hornung, K., Reed, A., Cicchetti, D., Hornung, K., … Toth, S. (2000). Recognizing Emotion in Faces : Developmental Effects of Child Abuse and Neglect. *Developmental Psychology*, *36*(5), 679–688. https://doi.org/10.1037//0012-1649.36.5.679

Rigoulot, S., & Pell, M. D. (2012). Seeing emotion with your ears: Emotional prosody implicitly guides visual attention to faces. *PLoS ONE*, *7*(1), 19–26. https://doi.org/10.1371/journal.pone.0030740

Rivers, S. E., Brackett, M. A., Reyes, M. R., Mayer, J. D., Caruso, D. R., & Salovey, P. (2012). Measuring Emotional Intelligence in Early Adolescence With the MSCEIT-YV: Psychometric Properties and Relationship With Academic Performance and Psychosocial Functioning. *Journal of Psychoeducational Assessment*, *30*(4), 344–366. https://doi.org/10.1177/0734282912449443

Roberts, R. D., Schulze, R., O’Brien, K., MacCann, C., Reid, J., & Maul, A. (2006). Exploring the Validity of the Mayer-Salovey-Caruso Emotional Intelligence Test (MSCEIT) with Established Emotions Measures. *Emotion*, *6*(4), 663–669. Retrieved from http://www.sciencedirect.com/science/article/pii/S1528354206602504

Roulin, N., & Ternes, M. (2019). Is it time to kill the detection wizard? Emotional intelligence does not facilitate deception detection. *Personality and Individual Differences*, *137*(August 2018), 131–138. https://doi.org/10.1016/j.paid.2018.08.020

Schirmer, A., & Adolphs, R. (2017). Emotion Perception from Face, Voice, and Touch: Comparisons and Convergence. *Trends in Cognitive Sciences*, *21*(3), 216–228. https://doi.org/10.1016/J.TICS.2017.01.001

Schlegel, K., Boone, R. T., & Hall, J. A. (2017). Individual Differences in Interpersonal Accuracy: A Multi-Level Meta-Analysis to Assess Whether Judging Other People is One Skill or Many. *Journal of Nonverbal Behavior*, *41*(2), 103–137. https://doi.org/10.1007/s10919-017-0249-0

Schlegel, K., Grandjean, D., & Scherer, K. R. (2012). Emotion recognition : Unidimensional ability or a set of modality- and emotion-specific skills ? *Personality and Individual Differences*, *53*(1), 16–21. https://doi.org/10.1016/j.paid.2012.01.026

Schlegel, K., Grandjean, D., & Scherer, K. R. (2014). Introducing the Geneva emotion recognition test: an example of Rasch-based test development. *Psychological Assessment*, *26*(2), 666.

Snodgrass, J. G., & Corwin, J. (1988). Pragmatics of measuring recognition memory: Applications to Dementia and Amnesia. *Journal of Experimental Psychology: General*, *117*(1), 34–50.

Thingujam, N. S., Laukka, P., & Elfenbein, H. A. (2012). Distinct emotional abilities converge: Evidence from emotional understanding and emotion recognition through the voice. *Journal of Research in Personality*, *46*(3), 350–354. https://doi.org/10.1016/J.JRP.2012.02.005

Trentacosta, C. J., & Fine, S. E. (2010). Emotion knowledge, social competence, and behavior problems in childhood and adolescence: A meta-analytic review. *Social Development*, *19*(1), 1–29. https://doi.org/10.1111/j.1467-9507.2009.00543.x