Social Cognitive and Affective Neuroscience

Decision Letter (SCAN-21-056)

From: lieber@ucla.edu

To: billy.mitchell@temple.edu

CC:

Subject: Social Cognitive and Affective Neuroscience - Decision on Manuscript ID SCAN-21-056

Body: 15-Mar-2021

Dear Mr. Mitchell,

Thank you for submitting the manuscript "Developmental Differences in Emotional Representation Between Prefrontal and Subcortical Structures" SCAN-21-056 to Social Cognitive and Affective Neuroscience. As you will see both reviewers are positively disposed towards the manuscript but each also raises issues that need to be addressed. Consequently, I would invite you to submit a revised manuscript that deals with the concerns raised by the reviewers.

To revise your manuscript, log into http://mc.manuscriptcentral.com/scan and enter your Author Center, where you will find your manuscript title listed under "Manuscripts with Decisions." Under "Actions," click on "Create a Revision." Your manuscript number has been appended to denote a revision. Once the revised manuscript is prepared, you can upload it and submit it through your Author Center.

If your paper is ultimately accepted, you will be required to pay the Open Access fee that is standard for all SCAN papers. Please see the journal's instructions for authors for further details (http://bit.ly/28MLCII).

If you require any additional information, please contact the Associate Editor handling your manuscript: ehtelzer@unc.edu

Thank you for submitting your manuscript to Social Cognitive and Affective Neuroscience and we look forward to receiving your revision.

Sincerely,

Dr. Eva Telzer
Associate Editor

Prof. Matthew Lieberman
Editor in Chief, Social Cognitive and Affective Neuroscience

Reviewer(s)' Comments to Author:

Reviewer: 1

Comments to the Author
The authors present analyses of neuroimaging data on children (aged 4-10) and adults examining how (dis)similarly they represent video clips of positive, negative, and neutral valence. The authors find that children showed greater similarity in representation than adults, and decomposition of effects suggests that it is driven by greater similarity in vmPFC within negative videos (though a full 3-way interaction is not significant). The authors conclude that there is maturation in emotion representation across development, particularly in how vmPFC "evaluates" affective stimuli.

This paper addresses an open and very interesting question in the field of developmental affective neuroscience. The authors use cutting-edge methods to uncover theoretically interesting results that extend prior research on emotion development. The paper is overall well written, and my concerns are mostly superficial. I include ideas for refining the paper's framing and analytic approach below.

Larger comments
- The paper would benefit from a clearer and more thorough review of prior literature on emotion development. There is a large literature on how children develop an understanding of specific emotions (Harris, Pons, Russell, Widen, Casey, Hoemann/Xu/Barrett, Nook/Somerville) that should be synthesized for readers to better situate the current findings in prior literature. Right now,

readers are left with the vague impression that "behavioral evidence suggests that emotion representations change across age" without a more specific description of current thinking on how exactly they change. I know word limits can be tight, but greater clarity on prior research seems important for interpreting these neural results.
- Relatedly, I was left wanting more support for specific neural hypotheses in the introduction. The authors have some very interesting interpretations of how the vmPFC contributes to emotion representation in the discussion (see also Satpute et al., 2017), and I think these ideas could be introduced earlier. This could replace much of the discussion of how RSA functions.
- In my opinion, a major threat to the study's logic is that the results might not be "about" emotion, as they could instead be driven by some other variable in the negative/positive videos. This is especially concerning given that the pos/neg videos included actual characters, whereas the neutral videos did not. The authors mention this in the limitations section, but to be honest to their methods, I think it should be discussed more openly, potentially shifting their study's framing to something like: "representations of affective social scenes become more differentiated from childhood to adulthood."
- Relatedly, I didn't fully follow the authors' logic with their neutral video control analysis… How does this analysis show that the result is specific to affect? A crucial contrast showing that similarity scores for neutral videos are equal between children and adults (suggesting that similarity scores only change across age for affective videos) is not reported, and beyond that even this analysis doesn't address the fact that neutral and pos/neg images differ in ways beyond just whether or not they are affectively charged (e.g., the inclusion of characters). So the logic here could be better articulated for readers. In fact I might suggest running just one omnibus ANOVA in which pos/neg/neu videos are all included in the main analysis. You can then show that there is a significant interaction such that pos/neg are represented more similarly than neu videos and that they also change more over age than neu videos.
- Another logical concern with the current paper that is left unaddressed is the fact that the authors discuss 'emotion' representation when all they do is examine representations categorized by 'affective valence' (i.e., negative, positive, neutral). Constructionist approaches (Barrett, 2006, 2017) distinguish between 'emotion' (a conceptualized instance of a specific emotion) and 'affect' (broader senses of valence/arousal that can be parsed into a specific emotion through conceptualization) but the current paper doesn't really dive into what this means for their findings. Is the implication that adults tend to construct their reactions to the negative videos in terms of several discrete negative emotions (e.g., "anger," "disappointment") but children seem construct their emotional responses in terms of a more valence-general concept of "bad" or "negative"? Such an interpretation accords with Nook et al., 2017, and although this explanation is hinted at, it is not explicitly stated.
- Similarly, there is no interpretation of the finding that negative scenes were represented more similarly than positive scenes. I think this is an interesting finding that accords with research on how differentiation of negative emotions is thought to be more important for mental health than differentiation of positive emotions (O'Toole et al., 2020), but more could be said about it.

Smaller comments
- The first sentence of the abstract is quite vague (how do emotions change?) and there's a typo in the 2nd sentence.
- The first sentence of the intro is a little grand… Don't we have strong feelings as adults? In fact, some researchers (Casey, Larson) would offer evidence that emotions are more intense in adolescence than adulthood…
- Please specify what was considered "excessive head motion"
- The control analysis arguing that negative and positive videos were similarly "extreme" in their portrayal of negative and positive expressions could be stated more clearly (i.e., it's not clear what you mean by "absolute emotional valence").
- Please include a figure showing the brain region masks
- Tables 1 and 2 use > instead of < for p values.
- I'm not sure you can have Fig 6 if the 3-way interaction is not significant
- Hoemann, Xu, & Barrett (2019) and studies by Nook et al. could enrich hypotheses for why emotion representations become more dissimilar across age on p. 18 (e.g., development of language).
- Brooks & Freeman also provide nice citations for last sentence of paragraph on p 18 about how conceptual similarity and RSA could be connected. Relatedly, is there evidence in the emotion decoding studies (Wager et al.) that could guide interpretation of how vmPFC vs NAcc/Amygdala contribute to specific emotion representations?
- I might recommend more classic citations for appraisal theory in the discussion (e.g., Ortony, Clore)
- Do you have any data on what discrete emotions these videos induce in children or adults? This would help address the affect v emotion distinction mentioned above.
- The limitations section could be expanded to include other potential threats to the conclusion that differences in representational similarity are due to age: (e.g., ages differing in brain structure/volume, movement, interpretation/meaning of videos)

Reviewer: 2

Comments to the Author
This study used representational similarity analysis to examine differences between children and adults in representation of affect in the amygdala, NAcc, and vmPFC. The findings suggest that

children show contrasting patterns between subcortical structures and vmPFC, as well as valence-specific differences in representational patterns, which were not evident in adults. The paper well-written, the use of RSA compelling, and the findings thought-provoking. I appreciated the clear description of limitations of mass univariate approaches and description of RSA in the intro, and that the authors made their data and scripts available. The lack of behavioral data is indeed a major limitation, though the authors acknowledge this point. I think this will make an important contribution to the literature on emotional development, and my comments are in the spirit of further strengthening the paper.

In the preprocessing section the authors state that "individual TRs were identified and adjusted for if greater than 15% of TRs were considered outliers, or if head motion values for any of the three rotations were greater than 1.5mm." This raised a few questions for me. What does it mean that individual TRs were identified and adjusted (how)? How were outliers defined?

Were there other motion cutoffs? (e.g., a participant was excluded entirely if a given % of TRs had to be adjusted due to being outliers, or because values exceeded a specific threshold e.g. on framewise displacement) The methods section notes that 12 participants were excluded due to excessive head motion but it's not clear how that was defined.

Minor notes:

-The authors note that they are not aware of any literature exploring changes in mPFC-NAcc connectivity during development. It would be nice to incorporate findings from Fareri et al 2015 (NeuroImage) here.

-p 6: "close the gap" felt overstated – I'm not sure one study can really close a gap, and especially since this study does not include adolescents, more work will be needed to fully understand developmental differences.

-p 5: "However, this may not be true for young children, as vmPFC-amygdala connectivity strengthens across normative development, only reaching adult-like patterns of functional connectivity around age 10 (Gee et al., 2013)." Though negative connectivity was evident after age 10, connectivity was still weaker than in adults (in other words, valence was consistent into adulthood starting around age 10, but magnitude/strength of connectivity continued to change). It would be helpful to revise this sentence a bit to more accurately reflect that connectivity was not yet adult-like at that point / during adolescence.

-p 20: "where children are more similar in that they have perhaps had comparable levels of exposure to the swath of emotional situations the world has to offer." While I appreciate the overall point, this stood out to me since there is of course substantial variability in exposure to emotional situations within children (e.g., literature on stressful life events). Perhaps the authors could revise this to say "more comparable"?

-p 12: "All ROIs were thresholded at 50%." I think this only refers to amygdala and NAcc since they were defined using the probabilistic atlas, whereas vmPFC was not? Perhaps specify amygdala and NAcc instead of saying "all."

-I think this is just a formatting issue with the PDF but the legends for figs 5/6 appeared missing but then showed up in the supplement. The letter notation for the affiliations in the supplement was also off.

Date Sent: 15-Mar-2021

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