



Basic emotion processing and the adolescent brain: Task demands, analytic approaches, and trajectories of changes



Larissa B. Del Piero*, Darby E. Saxbe, Gayla Margolin

Department of Psychology, University of Southern California, United States

ARTICLE INFO

Article history:

Received 16 July 2015

Received in revised form 14 March 2016

Accepted 15 March 2016

Available online 25 March 2016

Keywords:

Adolescence

Development

Emotion regulation

Emotional reactivity

Neuroimaging

ABSTRACT

Early neuroimaging studies suggested that adolescents show initial development in brain regions linked with emotional reactivity, but slower development in brain structures linked with emotion regulation. However, the increased sophistication of adolescent brain research has made this picture more complex. This review examines functional neuroimaging studies that test for differences in basic emotion processing (reactivity and regulation) between adolescents and either children or adults. We delineated different emotional processing demands across the experimental paradigms in the reviewed studies to synthesize the diverse results. The methods for assessing change (i.e., analytical approach) and cohort characteristics (e.g., age range) were also explored as potential factors influencing study results. Few unifying dimensions were found to successfully distill the results of the reviewed studies. However, this review highlights the potential impact of subtle methodological and analytic differences between studies, need for standardized and theory-driven experimental paradigms, and necessity of analytic approaches that can adequately test the trajectories of developmental change that have recently been proposed. Recommendations for future research highlight connectivity analyses and non-linear developmental trajectories, which appear to be promising approaches for measuring change across adolescence. Recommendations are made for evaluating gender and biological markers of development beyond chronological age.

© 2016 The Authors. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

Contents

1. Background	175
1.1. Delineating emotional processes	175
1.2. Delineating models of change	175
1.3. Delineating key brain regions	176
1.4. Goals of current review	176
2. Selection of studies	177
2.1. Experimental paradigms	177
2.2. Cohort and analysis approach	177
2.3. Brain region of interest delineation	178
3. Findings of emotion processing fMRI studies in adolescence	178
3.1. Key brain region findings	178
3.1.1. Emotional reactivity	178
3.1.2. Emotion regulation—concentration	178
3.1.3. Emotion regulation—distraction	178
3.1.4. Emotion regulation—cognitive change	178
3.2. Additional brain regions	178
3.3. Non-Linear analyses	184
3.4. Pubertal timing	184

* Corresponding author at: University of Southern California, Department of Psychology, 3620 McClintock Ave, Los Angeles, CA 90089-1061, United States.
E-mail address: ldelpier@usc.edu (L.B. Del Piero).

3.5. Gender effects.....	185
3.6. Connectivity analyses.....	185
4. Expanding directions for adolescent emotion processing research.....	185
4.1. Naturalistic emotion processing.....	185
4.2. Beyond basic emotion.....	186
4.3. Theoretical versus analytic approaches.....	187
4.4. Integrating multiple methodologies.....	187
4.5. Individual differences.....	187
5. Conclusion.....	187
Acknowledgements.....	187
References.....	187

1. Background

In 1904, psychologist Stanley G. Hall first characterized adolescence as a time of “storm and strife,” effectively laying the foundation for the popular conception of this period that persists to this day (Hall, 1904). Scores of popular books and movies depict teenagers as emotional, volatile, highly influenced by their social circle, and prone to risky behavior and poor decision-making. In contrast to this image, most researchers who study adolescence reject the notion that adolescence is a fundamentally tumultuous time, highlighting both strengths and difficulties during this developmental stage. From this line of research, new knowledge continues to emerge about the similarities and differences between adolescents and the adults that they ultimately become.

A core idea underlying the notion of “storm and strife” is that adolescents experience mood disruptions in daily life that differ from adults, particularly with regards to strong and volatile emotional experiences (Arnett, 1999). This is perhaps one of the most ubiquitously noted characteristics of adolescence and is a challenge to many parents and teachers. Furthermore, adolescence is a period of vulnerability for the initial onset of numerous mental illnesses, particularly illnesses that have emotion dysregulation as a core feature (Kessler et al., 2005). The societal cost of mental illnesses is significant (Murray and Lopez, 1996); therefore, research exploring adolescent emotion processing a vital and urgent priority. Despite the clear importance of understanding emotions and emotion regulation during this developmental stage, the nature of emotional changes during adolescence, particularly in terms of underlying biological mechanisms, remains poorly understood. We conducted a systematic review of neuroimaging research on emotion in the adolescent brain and sought to better characterize: (1) what components of emotion processing have been found to differ during adolescence from other developmental stages; (2) what trajectories of change have been theorized and empirically tested; (3) what questions remain unaddressed; and (4) what might be promising directions for future research.

1.1. Delineating emotional processes

In adolescent neuroimaging research, a multitude of experimental paradigms have been used to examine emotional reactivity and regulation. In trying to develop a cohesive picture of the state of this literature, it is clear that using a theoretical framework to integrate these disparate experimental approaches is an important first step.

Theoretical frameworks of emotion that delineate discrete emotional processes, range widely from theories positing that each emotion is a distinct state, elicited by discrete triggers, and manifested in unique biological and behavioral responses (Buck, 1999; LeDoux, 2000) to theories that consider emotions to be wholly social and cultural constructions that do not innately exist but are rather the product of ongoing socialization (Mesquita, 2010; for reviews of theoretical perspectives on emotion processing,

see Cole et al., 2004 and Gross and Barrett, 2011). However, the application of these types of theories to adolescent development, particularly as the conceptual basis for neuroimaging studies, has remained limited. Gross and Thompson (2009) propose an intermediate model of emotion processing, whereby: (1) individuals are placed in a given situation; (2) attention is directed to a particular stimulus; (3) they appraise, or interpret the emotional meaning of the stimulus; and (4) they engage in a response. Of all the theoretical models of emotion regulation that have been proposed, this framework is particularly helpful for contextualizing experimental studies of emotion regulation in adolescence (and more generally) because it clearly implicates several points at which emotion regulation can occur: situation selection, situation modification, attentional deployment, reappraisal/cognitive change, and response modification. Furthermore, these delineated steps can be translated into different types of experimental (particularly neuroimaging) paradigms (e.g., those that manipulate attention to emotion, those that involve a cognitive strategy to change an emotional reaction).

In the present review, the experimental methodologies used in each study are parsed into different components of emotion regulation as defined in the Gross and Thompson (2009) model. Specifically, as shown in Fig. 1, we examine emotional reactivity (unregulated emotional experience) as well as emotion regulation through attentional deployment and cognitive change strategies. This delineation allows for comparisons across the diverse experimental methodologies that have been used in the field by highlighting groups of studies that are tapping common underlying emotional demands. Throughout this review, we use “emotion processing” as a general term to refer to the processes of both emotional reactivity and emotion regulation, as both are foci of this review. By mapping experimental paradigms onto a relevant theoretical model, we hope to begin parsing the complex neuroimaging literature on adolescent emotion.

1.2. Delineating models of change

Another dimension to examine in the disparate studies within this body of literature is method of analysis used to assess change over time and change trajectories. A model proposed by Casey (2013) is helpful for defining different types of linear and non-linear change trajectories. In this framework, *adolescent nonspecific* changes are those that begin in childhood and continue to develop at a steady, linear pace through adolescence. *Adolescent emergent* processes are those that develop from childhood to adolescence and then remain largely stable into adulthood. Finally, *adolescent specific* changes are those that emerge uniquely during adolescence, but are not present in either child- or adulthood.

The primary analytic approaches used in the reviewed studies involved testing between-group differences or linear changes associated with age. Furthermore, some of the studies reviewed, captured only a segment of the developmental trajectory (e.g., chil-

Download English Version:

<https://daneshyari.com/en/article/4316429>

Download Persian Version:

<https://daneshyari.com/article/4316429>

[Daneshyari.com](https://daneshyari.com)