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## The development of emotion regulation in adolescence: What do we know and where to go next?

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17                   **The development of emotion regulation in adolescence:**  
18                   **what do we know and where to go next?**

19           Emotion regulation, defined as “the process of modulating the occurrence, duration, and  
20 intensity of internal states of feeling (both positive and negative) and emotion-related  
21 physiological processes” (Morris et al., 2017, p. 1), comprises both extrinsic (e.g., parents and  
22 peers) and intrinsic (e.g., psychosocial adjustment strategies) processes that are responsible for  
23 accomplishing one’s goals when approaching emotions (Thompson, 1994). Emotion regulation  
24 is particularly critical during adolescence to cope with its many changes and new emotional  
25 situations. Major developmental tasks in adolescence involve significant regulatory challenges.  
26 Indeed, many adolescents experience heightened emotional sensitivity along with an  
27 immaturity of their regulatory processes, often accompanied by risk-taking behaviors (e.g.,  
28 Casey et al., 2015). Emotion regulation is crucial for adolescents’ psychosocial adjustment  
29 given its consequences for social relationships, well-being, psychopathology, and maladaptive  
30 behaviors (e.g., Eichengreen et al., 2022; King et al., 2022; McRae, Jacobs, et al., 2012; Nelis  
31 et al., 2011, Nolen-Hoeksema, 2012; Zyberaj, 2022).

32           Since the late 20<sup>th</sup> century, an increasing interest in the study of emotion regulation has  
33 led to significant advances when considering adult literature and models. Emotion regulation  
34 models can be divided into two categories: (1) models centered on emotion regulation strategies  
35 (e.g., Gross, 2015a, 2015b), which describe how individuals regulate their emotions; and (2)  
36 models centered on emotion regulation abilities (e.g., Preece et al., 2018), which focus on  
37 individuals’ effectiveness in regulating their own emotions. Although these models respectively  
38 address different aspects of emotion regulation, they are not mutually exclusive (Tull & Aldao,  
39 2015). Emerging concepts are at the intersection of these two approaches, such as emotion  
40 polyregulation (i.e., using multiple strategies to face an emotional event, Ford et al., 2019), or

41 emotion regulation flexibility (i.e., using different strategies depending on the emotional  
42 context and the person's goals, Aldao et al., 2015; Bonanno & Burton, 2013).

43         Conceptual frameworks on emotion regulation in adolescence are scarce (Hollenstein &  
44 Lanteigne, 2018). Existing models are designed to be parsimonious and focus specifically on  
45 developmental dynamics in this period. There are a large number of empirical studies in  
46 adolescence, but they do not consider the theoretical distinction between strategies and abilities,  
47 along with proposals for clarifications in methodological designs and interpretations. This  
48 absence of distinction leads to confusion in the existing literature and does not provide a precise  
49 picture of the development of emotion regulation (e.g., concluding about the effectiveness of a  
50 given strategy without including contextual and emotion-specific aspects). Adolescents learn  
51 how to use new strategies such as cognitive reappraisal effectively (e.g., Silvers, 2022), along  
52 with the development of more complex abilities (e.g., emotion polyregulation and flexibility).  
53 However, the literature in youth has focused mainly on how children develop regulatory  
54 abilities (e.g., controlling behavior) and specific strategies (e.g., expressive suppression) rather  
55 than how they are managed in adolescence once developed at a primary level. We argue that  
56 research on emotion regulation in adolescence would benefit from more conceptual clarity.

57         This article reviews our current understanding of emotion regulation in adolescence and  
58 proposes future directions. We first examine the developmental changes in adolescence that are  
59 relevant for emotion regulation. We then review existing knowledge about emotion regulation  
60 in adolescence, focusing on conceptual distinctions and limitations in the current literature. To  
61 include recent concepts from adult models such as emotion regulation flexibility and emotion  
62 polyregulation in a coherent framework, we posit that emotion regulation abilities can be  
63 divided into two categories: goal-pursuit and effectiveness abilities. We finally suggest new  
64 perspectives for research on emotion regulation in adolescence in light of the importance of its

65 contextual aspects, the different processes and time scales of emotion regulation, and focusing  
66 on both its predictors and outcomes.

### 67 **Normative changes related to emotion regulation during adolescence**

68 Adolescence is a developmental period characterized by emotional, cognitive,  
69 neurological, and social changes that underpin emotion regulation development (Hollenstein &  
70 Lougheed, 2013). Adolescents experience different changes in intensity and lability depending  
71 on the emotion considered. For instance, Maciejewski and colleagues (2015, 2017) reported  
72 negative quadratic evolutions in the intensity of anger, sadness, and anxiety during adolescence,  
73 with a peak of intensity in middle adolescence for anger, and in late adolescence for sadness  
74 and anxiety. Lability of anger and sadness decreases linearly during adolescence. However,  
75 lability of anxiety follows a cubic shape, with the highest peak in early adolescence and the  
76 lowest peak in late adolescence. These peaks of emotional intensity and lability are thought to  
77 be elicited from new situations (e.g., first romantic relationship, vocational related questioning,  
78 Larson & Ham, 1993). Importantly, it should be noted that emotional development appears to  
79 occur in an emotion-specific manner, suggesting that emotion regulation may take place in a  
80 similar fashion (e.g., De France & Hollenstein, 2022).

81 The development of emotion regulation is linked closely to higher cognitive processes  
82 such as executive functions (e.g., Gross, 2015a; Thompson, 2011). Executive functions  
83 encompass an array of cognitive processes that enable individuals to control their thoughts and  
84 actions to pursue goal-directed behaviors (Miyake & Friedman., 2012). These functions are  
85 essential in multiple aspects of emotion regulation during adolescence (e.g., Steinberg, 2008).  
86 Indeed, functions such as inhibition, set-shifting and updating continue to develop throughout  
87 this period, up to adulthood (e.g., Boelema et al., 2014; Carriedo et al., 2016; Theodoraki et al.  
88 2020). Considering the crucial role of goal-directed behaviors in the successful use of emotion  
89 regulation strategies, it is safe to assume that executive functions development allows

90 adolescents to use more and more cognitively complex strategies adapted to each situation.  
91 Thus, executive functions are likely to contribute to increase the repertoire of strategies in  
92 adolescence (i.e., the number of strategies that adolescents can use). Accordingly, individuals  
93 during late adolescence are more likely to mobilize emotion regulation strategies to deal with  
94 situations characterized by high emotional intensity in a socially appropriate manner (Lennarz  
95 et al., 2018). In the same way, recent studies with adolescents showed age-dependent relations  
96 between executive functions and the use of different emotion regulation strategies (Fombouchet  
97 et al., 2022). These relations are supported by neural circuits that are partially overlapping and  
98 continue to develop until adulthood (e.g., Pozzi et al., 2021). Studies also indicated that the  
99 prefrontal cortex, which neurologically supports executive functions and emotion regulation  
100 aspects (i.e., modulation of intensity and duration of negative emotions, implementation of  
101 strategies such as cognitive reappraisal; Zelazo & Cunningham, 2007) follows a long and  
102 protracted development until the mid-twenties (Crone & Steinbeis, 2017; Theodoraki et al.,  
103 2020). Neuroimaging studies showed that adolescents exhibit increased amygdala activity and  
104 reduced prefrontal cortex activity during the use of emotion regulation strategies compared to  
105 adults, resulting in lower effectiveness of emotion regulation (e.g., Stephanou et al., 2016). This  
106 gap between the activation of emotional processes and their regulation leads to what authors  
107 pointed out as a maladaptive shift during adolescence that is characterized by greater reliance  
108 on maladaptive strategies such as rumination (Cracco et al., 2017; Zimmermann & Iwanski,  
109 2014). Finally, adolescence also is characterized by strong age inter-group and individual  
110 variabilities in executive and emotion regulation performance (e.g., Best & Miller, 2010; Crone  
111 & Steinbeis, 2017; Hughes, 2011; Theurel & Gentaz, 2018).

112 In adolescence, social contexts appear to be more salient and elicit more intense  
113 emotions, which may challenge the use of emotion regulation strategies and emotion regulation  
114 abilities. Indeed, there is growing evidence suggesting that neural circuits supporting affective

115 responding are highly sensitive to contextual influences, especially during adolescence (Guyer  
116 et al., 2016). The adolescent brain is attuned to social stimuli, which facilitates flexible  
117 responding among salient and changing social contexts (Crone & Dahl, 2012). However, this  
118 flexibility also is associated with vulnerabilities: adolescents assign elevated reward value to  
119 peers, which results in greater response to the potential rewards of risk taking (Blakemore &  
120 Robbins, 2012; Casey et al., 2015). During adolescence, emotional stimuli or events lead to an  
121 increased reactivity of the limbic system, due to the immaturity of the prefrontal regions, and  
122 thus of the executive functions. The prefrontal cortex is still partially immature in adolescence,  
123 which would explain the greater propensity of adolescents to present typical difficulties in  
124 regulating their emotions.

125 Nelson and Guyer's (2011) have described adolescence as a period of  
126 neurodevelopment that aligns with social reorientation, in which peer social interactions are  
127 becoming increasingly important. Indeed, the increase of brain activation within the affective  
128 domain corresponds to patterns of social salience and behavioral engagement. Subcortical  
129 structures may be more sensitive to cues related to peer acceptance in early adolescence and to  
130 intimacy in late adolescence (Nelson et al., 2016). Thus, the heightened sensitivity to rewards  
131 and the emotions elicited in social contexts may influence emotion regulation in adolescence,  
132 particularly goal-pursuit abilities such as emotion regulation flexibility. Indeed, exploring the  
133 contexts of peers and romantic relationships may not only create risks, but also may contribute  
134 to the development of new emotion regulation strategies and their flexible use, depending on  
135 the contexts. These neurological and cognitive changes are supported by empirical research that  
136 focus on changes in social relationships during adolescence, in relation to emotion regulation.

137 Indeed, parents and peers are important agents in the development of adolescents'  
138 emotion regulation through emotion socialization, and autonomous functioning which is one of  
139 the main developmental tasks in adolescence (e.g., Noom et al., 2001). Emotion socialization

140 is a dynamic process that involves a broad range of social, verbal, and embodied practices,  
141 through which caregivers mediate normative ways of interpreting and expressing emotions  
142 (Cekaite & Ekström, 2019). Relations with parents evolve in multiple ways during adolescence.  
143 First, adolescents spend more time out of the direct monitoring of their parents (Mooney et al.,  
144 2007), leading to less extrinsic emotion regulation from parents and more intrinsic emotion  
145 regulation from adolescents (Cole et al., 2004; Morris et al., 2007). Second, a reorganization of  
146 parent-adolescent relations usually occurs which comes from the redefinition of the content of  
147 life domains as adolescents' autonomy increases (Smetana, 1988; Smetana & Asquith, 1994;  
148 Smetana et al., 2006). This reorganization can be challenging for both parents and adolescents  
149 and is associated with more frequent conflicts with parents in middle adolescence, which elicit  
150 negative emotions (Granic et al., 2003). A moderate frequency of conflicts with parents seems  
151 to be a great context for adolescents to express emotion flexibility (Lichtwarck-Aschoff et al.,  
152 2009). Eventually, relationships with parents evolve to a more horizontal fashion than at the  
153 beginning of adolescence. Parental emotion socialization can occur in multiple ways: through  
154 parental general practices, through emotion specific practices (e.g., reactions to adolescents'  
155 negative emotions) or through parental own emotion regulation (Morris et al., 2017, 2007).

156       During early adolescence (11 to 13 years old), supportive maternal reactions are linked  
157 positively to adaptive anger emotion regulation, whereas unsupportive reactions are related  
158 negatively to adaptive anger and sadness emotion regulation (Berona et al., 2022). In mid-  
159 adolescence, adolescents perceive that their parents respond to their negative emotions in a  
160 more supportive (i.e., validating and reinforcing emotional expression) than neglectful (i.e.,  
161 ignoring emotional expression) manner (Miller-Slough & Dunsmore, 2019). Both override (i.e.,  
162 minimizing the importance of adolescents' emotion) and punitive (i.e., disapproving, mocking  
163 or criticize adolescents' feelings) parental responses to negative emotions predict an increase  
164 in adolescents' emotion regulation abilities. On the contrary, magnification (i.e., mirror and



165 amplify adolescents' emotion) and neglect predict a decrease in adolescents' emotion regulation  
166 abilities (Miller-Slough & Dunsmore, 2019). These results suggest that parental reactions  
167 fading away adolescents' negative emotions (override and punitive reaction) may help  
168 adolescents to move on or to adapt from an inappropriate emotional expression. In the other  
169 way, parental reactions that amplify or ignore adolescents' negative emotion may increase  
170 emotional distress. Although, the results of this study have to be carefully interpreted because  
171 adolescents' emotion regulation abilities were reported by parents (Miller-Slough & Dunsmore,  
172 2019). The way parents regulate their own negative emotions also plays an important role in  
173 adolescents' development of emotion regulation. Difficulties in parental emotions regulation  
174 are associated with dysregulation in adolescence (e.g., Crandall et al., 2016; Crespo et al., 2017;  
175 Saritaş et al., 2013). Overall, research shows that both parents' and adolescents' emotion  
176 regulation shape each other, highlighting the active part of adolescent in emotional socialization  
177 (Morris et al., 2017).

178 Another major social change during adolescence concerns relationships with  
179 peers (Collins & Laursen, 2004) which become more intimate (Berndt, 1982) and reciprocal  
180 (Youniss & Haynie, 1992), and romantic relationships usually appear (Simon et al., 2008).  
181 Unlike the relationships with parents, those between peers are fully horizontal and can  
182 be associated with extrinsic emotion regulation (Dixon-Gordon et al., 2015, Miller-Slough &  
183 Dunsmore, 2016). In terms of gender differences, adolescent girls who perceive  
184 punishing reactions (i.e., a punishment decreasing parental exposure to adolescents' emotions)  
185 from their friends experience more emotion regulation difficulties than boys. Girls also perceive  
186 a decrease in friends' punishment and an increase in supporting reactions to negative emotions.  
187 In contrast, adolescent boys who perceive magnification (i.e., reacting with similar or stronger  
188 emotion expression) and overriding reactions (i.e., decreasing or distracting adolescent from  
189 his emotions) from their friends demonstrate fewer emotion regulation difficulties and perceive

190 a decrease in neglect reactions and an increase in overriding reactions (Miller-Slough &  
191 Dunsmore, 2019).

192 Parents' and peers' reactions to adolescent's negative emotions are perceived differently  
193 by adolescents. In addition, parents' and peers' reactions are linked differently to adolescents'  
194 emotion regulation abilities. Thus, adolescents learn how to regulate their emotions according  
195 to with whom they interact. As adolescents become more sensitive to social stimuli (Guyer et  
196 al., 2016; Nelson et al., 2016; Schriber & Guyer, 2016), this increase may help them to evaluate  
197 social demands and opportunities in different contexts, and to implement the most effective  
198 emotion regulatory strategies accordingly (Bonanno & Burton, 2013). As peer relationships are  
199 less stable than parental relationships, adolescents may perceive peers' punishing reactions as  
200 more threatening. For example, perceptions of punishing reactions from parents are linked with  
201 fewer emotion regulation difficulties than punishing reactions from peers which are linked with  
202 more emotion regulation difficulties (Miller-Slough & Dunsmore, 2019). Thus, emotion  
203 regulation strategies such as expressive suppression or concealing may be more effective to  
204 maintain relationships with peers than with parents (Perry-Parrish & Zeman, 2011). Hence,  
205 emotion regulation flexibility appears crucial in adolescence to maintain positive relationships  
206 with both parents and peers, although they differ in terms of characteristics (e.g., hierarchical  
207 vs. horizontal relationships; girls vs. boys) and contexts in which they take place (e.g., home  
208 vs. school).

### 209 **Emotion regulation development during adolescence**

210 In adolescence, emotion regulation strategies and abilities may develop together,  
211 leading to cognitive and social changes at this period. Many authors consider that emotion  
212 regulation becomes more and more efficient during adolescence (e.g., Gross, 2015a). However,  
213 studies reported unclear and inconsistent results. Hereafter, we present empirical findings about  
214 emotion regulation development as well as the theoretical conceptions to which they can be

215 related. We conclude this section by highlighting current limitations in the literature and by  
216 discussing how recent concepts and findings are moving toward integrating emotion regulation  
217 strategies and abilities.

### 218 *The development of emotion regulation strategies*

219         Developmental studies have documented age-related changes in emotion regulation  
220 strategies from childhood to adolescence (Bariola et al., 2011; Cracco et al., 2017; Jaffe et al.,  
221 2010; Morris et al., 2017). It should be noted these studies focused mainly on the development  
222 and outcomes of only two emotion regulation strategies, namely: reappraisal (form of cognitive  
223 change) and expressive suppression (form of response modulation). Indeed, most studies on  
224 emotion regulation strategies in adolescence are based on Gross's (1998) first process model of  
225 emotion regulation. This model describes the temporal features of five families of strategies  
226 (i.e., situation selection, situation modification, attentional deployment, cognitive change, and  
227 response modulation).

228         Research stresses that cognitive reappraisal is a strategy that leads to greater adaptation  
229 than expressive suppression (e.g., Gresham & Gullone, 2012; Young et al., 2019). Results  
230 concerning age-related changes in the use of these strategies are more nuanced: Reappraisal is  
231 a strategy that becomes efficient during adolescence (e.g., Silvers & Guassi Moreira, 2019;  
232 Theurel & Gentaz, 2018), whereas expressive suppression is already effective during late  
233 childhood (see Gross & Cassidy, 2019 for a review). Gullone et al. (2010) showed that between  
234 9 and 15 years, participants resorted less and less to expressive suppression, whereas cognitive  
235 reappraisal remained stable. This decrease in expressive suppression matches Gross's (1998)  
236 first model, as children and adolescents move toward emotion regulation strategies that  
237 generally are considered as more adaptive. However, observations on cognitive reappraisal only  
238 are partially in line with this model as the use of this strategy is thought to increase throughout  
239 adolescence (Chervonsky & Hunt, 2019; Gullone et al., 2010).

240 In Gross' (1998) first model, little attention was paid to contextual aspects of emotion  
241 regulation, to what leads individuals to use one strategy over another, and to how these  
242 strategies are started or stopped. In Gross's (2015a, 2015b) extended process model, emotion  
243 regulation is conceptualized as a dynamic process aiming for a goal which is situation-  
244 dependent. Beyond the use of emotion regulation strategies in negative contexts, developmental  
245 changes are related to context characteristics such as specific emotions and emotion intensity  
246 (e.g., De France & Hollenstein, 2022; Smith et al., 2022). In emotion-specific situations, age-  
247 related changes have been demonstrated in the implementation of emotion regulation strategies  
248 (Zimmermann & Iwanski, 2014): expressive suppression is more likely to be used by 15-year-  
249 old than by 13-year-old adolescents, in fear situations more than in sadness or anger ones. The  
250 intensity of negative emotions has been identified as an important factor in the use of emotion  
251 regulation strategies during adolescence (Lennarz et al., 2018). When the intensity of negative  
252 emotions is low, acceptance (i.e., recognizing and embracing negative emotions) is more likely  
253 to be used, whereas when intensity is high, expressive suppression, problem-solving,  
254 distraction, avoidance, social support and rumination (i.e., repeatedly focusing on emotional  
255 experience, reasons and consequences) are used instead (Lennarz et al., 2018). Although  
256 Gross's (2015a, 2015b) extended process model of emotion regulation highlights the  
257 importance of the characteristics of emotions (e.g., valence and intensity), it only describes the  
258 implementation of a single emotion regulation strategy. Furthermore, it does not specify  
259 explicitly the factors that may influence the development of these valuation systems, the  
260 individual differences in their implementation, and the differences in the effectiveness and  
261 outcomes of emotion regulation attempts (Riediger & Luong, 2015).

### 262 *The development of emotion regulation abilities*

263 In adolescence, cognitive and social changes challenge the development of adolescents'  
264 abilities to regulate their emotions. Emotion regulation abilities are defined as the "ways in

265 which individuals understand, regard and respond to their emotional experience” (Tull & Aldao,  
266 2015, p. 2). Within this framework, we distinguish two types of conceptualizations that are  
267 relevant for adolescents’ development: (1) effectiveness abilities and (2) goal-pursuit abilities.

268 Effectiveness abilities refer to perceived or observable outcomes in emotion regulation  
269 attempts, most notably the control of behavior in emotional contexts and the monitoring of  
270 emotions (e.g., Gratz & Roemer, 2004; Hofmann & Kashdamm, 2010; Preece et al., 2018).  
271 Emotion regulation effectiveness abilities improve with age, awareness of motivation, emotion  
272 type and contextual factors (Zeman et al., 2006). Theoretically, adolescents increasingly are  
273 able to control their emotions and behaviors. In this sense, a longitudinal study with adolescents  
274 from 12 to 18 years showed a decrease in dysregulation (Memmott-Elison et al. 2020). In their  
275 cross-sectional study, Zimmermann and Iwanski (2014) highlighted age-related patterns in  
276 effectiveness abilities that sometimes depended on the emotion. Adaptive regulation increased  
277 in late adolescence for the three emotions considered (anger, sadness, fear). A similar increase  
278 of dysregulation was observed for the emotions of anger and sadness but not for fear. In  
279 addition, this study also pointed out a decrease in adaptive regulation between early and mid-  
280 adolescence, which may be explained by a higher intensity of negative emotions and difficulties  
281 in emotion regulation. Given the differences in the use of strategies and levels of abilities across  
282 emotions, it appears that specific emotion states moderate the association between strategies  
283 and effectiveness abilities.

284 Goal-pursuit abilities correspond to how individuals access strategies perceived as  
285 adaptive and use multiple emotion regulation strategies in various contexts (in continuation of  
286 Gross’s extended process model; Gross, 2015b). These abilities are decisive in linking emotion  
287 regulation abilities and strategy models because they are based on ideas introduced in both  
288 conceptualizations of emotion regulation. In this framework, two main abilities can be  
289 identified: emotion regulation flexibility and polyregulation (Aldao et al., 2015; Bonanno &

290 Burton, 2013; Ford et al, 2019). Flexibility is an inter-situation implementation of multiple  
291 emotion regulation strategies and polyregulation refers to the intra-situation implementation of  
292 multiple strategies (Ford et al., 2019). Together, these two types of abilities enable the flexible  
293 use of situationally appropriate emotion regulation strategies in order to meet the demands of  
294 both the situation and the individual's goals. Although interindividual differences among  
295 adolescents are mentioned in the literature, studies on these abilities are scarce and most of  
296 them have focused on specific components, such as the repertoires of strategies (i.e., one  
297 component of emotion regulation flexibility in Bonanno & Burton's model, 2013). Loughheed  
298 and Hollenstein (2012) showed that adolescents who reported using few or no emotion  
299 regulation strategies demonstrated the highest levels of internalizing problems. Conversely, the  
300 adolescents who mobilized a larger repertoire of emotion regulation strategies reported higher  
301 psychosocial well-being.

302 Polyregulation seems to be linked to situations eliciting highly intense emotions (e.g.,  
303 Aldao & Nolen-Hoeksema, 2013). Such a situation may require the implementation of multiple  
304 emotion regulation strategies. Furthermore, polyregulation may be concurrent or sequential  
305 (Ford et al., 2019), depending on the characteristics of the emotional context or the regulation  
306 goals of the individual. In a stressful situation of waiting for an important oral examination, an  
307 adolescent may play on their phone (i.e., avoidance) and text peers in search of their support  
308 (i.e., support-seeking) at the same time. Alternatively, they may use reappraisal to modify the  
309 evaluation of the situation while waiting (e.g., downplaying the importance of the examination),  
310 and then use expressive suppression (e.g., hide fear in front of assessors with a poker face)  
311 before entering the room where the examination takes place. However, polyregulation, per se,  
312 is not adaptive and may be used by individuals depending on their difficulties in evaluating the  
313 best strategy to reach a regulation goal. In line with this hypothesis of emotion polyregulation  
314 development during adolescence, Lennarz et al. (2018) showed that adolescents can use

315 multiple strategies sequentially or concurrently when a negative emotion is intense. For  
316 example, an adolescent feeling anger because of a bad grade may first implement expressive  
317 suppression, for example by not lashing out on the teacher, and then reappraise the event, for  
318 example by thinking that the comments on the exam paper will be helpful in the future (i.e.,  
319 sequential polyregulation). In the same situation, another adolescent may use expressive  
320 suppression and rumination together, for example by maintaining a still face while repeatedly  
321 thinking about the situation and the negative emotions that are associated with it (i.e.,  
322 concurrent polyregulation). Such differences in emotion regulation repertoires and emotion  
323 polyregulation might be related to different outcomes, depending on the goal activated in a  
324 particular situation. However, there is a lack of empirical research on these aspects in  
325 adolescence.

#### 326 *Limitations in existing literature on emotion regulation in adolescence*

327         Although emotion regulation abilities and the use of emotion regulation strategies are  
328 distinguishable processes, they may share bidirectional relationships (Tull & Aldao, 2015).  
329 These links are all the more apparent with goal-pursuit abilities, which are defined on the basis  
330 of strategy and abilities models. On the one hand, emotion regulation abilities can be considered  
331 as processes that influence the use of emotion regulation strategies and their efficiency in any  
332 given situation. On the other hand, the repeated use of emotion regulation strategies in different  
333 contexts may contribute to reducing or increasing emotion regulation abilities, depending on  
334 what is adaptive or not for the individual. As previously mentioned, the development of emotion  
335 regulation strategies and abilities during adolescence needs to be described precisely. Beyond  
336 a lack of longitudinal studies, this limitation is due partly to a confusion between emotion  
337 regulation strategies and abilities. In their study, Zimmermann and Iwanski (2014) labeled as  
338 strategies all the dimensions they measured, but some items or subscales theoretically should  
339 refer to abilities. Their dysregulation subscale theoretically should refer to an emotion

340 regulation ability (or a lack of emotion regulation abilities), although some items in this  
341 subscale also refer to strategies of self-blaming and blaming others. Similarly, the adaptive  
342 regulation subscale comprised items measuring strategies of reappraisal or problem-solving,  
343 whereas other items referred to abilities such as how adolescents approach their emotions.

344         One of the main issues we identified in studies on emotion regulation in adolescence is  
345 the use of measures originally designed for adults, within the framework of the first models of  
346 emotion regulation such as the Emotion Regulation Questionnaire for Children and Adolescents  
347 (Gullone & Taffe, 2012) and the Cognitive Emotion Regulation Questionnaire (CERQ,  
348 Garnefski et al., 2001). First, these questionnaires assess a limited number of strategies, with  
349 reference to Gross' (2001) first model. For instance, the CERQ evaluates nine strategies,  
350 categorized as adaptive vs. maladaptive because most of them belong to the same families of  
351 strategies and are highly correlated. Second, these questionnaires are designed for adults,  
352 meaning that the strategies examined in these questionnaires are not necessarily part of the  
353 repertoires of adolescents or those that they use mostly when dealing with emotional events  
354 (e.g., social support-seeking). Third, emotional characteristics such as the regulation of specific  
355 emotions and emotional intensity are not taken into account in most of the studies with  
356 adolescents. Finally, measures of emotion regulation strategies in general negative contexts  
357 cannot provide knowledge about goal-pursuit or effectiveness abilities. These limits need to be  
358 addressed in order to assess whether adolescents are efficient at regulating their emotions.

359         Interestingly, conceptualizations of emotion regulation, both for strategies and abilities,  
360 are evolving toward a more dynamic approach. Emotion regulation involves  
361 neurophysiological, cognitive, behavioral and social components. Although it is generally  
362 accepted that adolescence constitutes a specific period for the development of emotion  
363 regulation, information on the developmental trajectories of the multiple emotion regulation  
364 processes is lacking. Most studies are cross-sectional, which may confound age differences with



365 cohort effects and does not allow direct investigation of how specific processes such as  
366 strategies, effectiveness and goal-pursuit abilities change with age. The different processes  
367 involved in emotion regulation also rarely are distinguished explicitly, and a limited number of  
368 strategies is investigated. Therefore, the issues of how adolescents mobilize various strategies  
369 when experiencing new and different contexts, how efficient they are at it, and how emotion  
370 regulation aspects change during adolescence in relation with other constructs remain elusive.

### 371 **Future directions for studying emotion regulation during adolescence**

372 In this article, we focused on voluntary and explicit emotion regulation. However,  
373 implicit and more automatic forms of implicit emotion regulation have been discussed in the  
374 literature. Contrary to explicit emotion regulation, implicit processes are engaged without  
375 explicit instructions to modulate emotional responses, and individuals report a very poor  
376 awareness of such modulation (Gyurak et al., 2011). As the habitual use of emotion regulation  
377 strategies prompts real-time emotion regulation unintentionally when confronted with  
378 emotional situations, the habitual use of specific strategies is considered to be a form of implicit  
379 emotion regulation (Zou & Yuan, 2022). Nevertheless, the habitual use of emotion regulation  
380 strategies can be made explicit by asking participants about their emotion regulation processes  
381 in a short-time scale (Silvers, 2022). Definitions and models of emotion regulation strategies  
382 and abilities may still be valid at the implicit level, but studies on these aspects of emotion  
383 regulation remain scarce, especially in the period of adolescence.

384 In this section, we propose four research directions. First, we stress the need to move  
385 toward a more contextualized approach to emotion regulation strategies and abilities in order  
386 to understand better the relations between these two fundamental aspects of emotion regulation  
387 in adolescence. This contextualized approach might allow researchers to capture the  
388 development of understudied aspects of emotion regulation such as goal-pursuit abilities (e.g.,  
389 emotion regulation flexibility, emotion polyregulation). Second, we promote and discuss the

390 relevance of studies including the different time scales of emotion regulation (i.e., real time and  
391 developmental scale). Third, we argue that using mixed methods is critical to capture the  
392 various aspects of emotion regulation. Fourth, we highlight the necessity to investigate how  
393 developmental processes relate to emotion regulation in order to understand better the  
394 mechanisms underlying age-related changes and interindividual differences in emotion  
395 regulation during adolescence. These directions should help improve our knowledge of the  
396 development of the multiple processes that are involved in emotion regulation in adolescence.

397 *Moving toward a contextualized emotion regulation framework in adolescence*

398         As highlighted in the present article and by other authors (e.g., De France & Hollenstein,  
399 2022, Smith et al., 2022), the development of emotion regulation is related to discrete emotions  
400 (e.g., sadness or anger), their characteristics (e.g., valence, intensity) and contextual factors  
401 (e.g., academic or interpersonal context). Theoretical advances in emotion regulation have led  
402 to the conceptualization of key abilities in assessing the effectiveness of emotion regulation in  
403 various emotional situations and contexts (e.g., at school, with parents). Measuring goal-pursuit  
404 abilities such as emotion regulation flexibility or emotion polyregulation requires evaluating  
405 strategies in different meaningful contexts. In Bonanno and Burton's (2013) model, emotion  
406 regulation flexibility is subserved by three components that may explain interindividual  
407 differences in emotion regulation: individual context sensitivity, repertoire and feedback.  
408 Similarly, emotion polyregulation (Ford et al., 2019) involves the use of multiple strategies  
409 when experiencing an emotional event and depends on the goals activated in a given situation.  
410 Existing knowledge on cognitive, socio-cognitive and neurological changes as previously  
411 reported suggest changes in emotion polyregulation and flexibility during adolescence.  
412 Nevertheless, these changes have yet to be documented.

413         Few studies have focused both on emotion regulation strategies and abilities in specific  
414 contexts experienced by adolescents. Therefore, there is an urgent need for cross-sectional and

415 longitudinal studies measuring these aspects of emotion regulation, in order to understand better  
416 how adolescents regulate their emotions in interaction with meaningful contexts. In emerging  
417 adults, Dixon-Gordon et al. (2015) found different patterns of emotion regulation strategies in  
418 academic and interpersonal contexts. Future studies also should evaluate the efficacy - real or  
419 perceived - of emotion regulation, and explore how the development of emotion regulation  
420 strategies and abilities is shaped by experiences and contexts such as romantic relationships,  
421 interactions with peers and parents, academic or extracurricular activities. These studies would  
422 help to identify general trends, as well as interindividual differences in contexts that are critical  
423 for the development of emotion regulation during adolescence.

424         Furthermore, we believe that moving toward a contextualized approach to emotion  
425 regulation necessarily involves the use of a person-oriented approach (e.g., Bergman &  
426 Wandby, 2014). Until now, most studies on emotion regulation have used a variable-oriented  
427 approach, testing associations between separate variables (e.g., linking one emotion regulation  
428 strategy with an outcome). In contrast, the person-oriented approach considers patterns and  
429 assumes that grouping people according to similar profiles can help to predict outcomes better  
430 (Laursen & Hoff, 2006). The size of the repertoires of emotion regulation is related to  
431 adolescents' adaptation to their environment, as shown by person-oriented studies (e.g.,  
432 Lennarz et al., 2018; Lougheed & Hollenstein, 2012). Based on a person-oriented approach,  
433 studies should characterize emotion regulation profiles that are associated with different levels  
434 of adolescents' psychosocial adjustment and personal characteristics (e.g., age, gender). This  
435 should contribute to more individualized support and prevention regarding emotion regulation.  
436 Indeed, adopting a person-oriented approach can help clinicians on two complementary levels.  
437 First, rather than focusing on emotional regulation strategies independently, it is possible to  
438 consider an individual profile and detect atypical emotion regulation repertoires associated with  
439 psychological difficulties or psychopathology (e.g., eating disorders, generalized anxiety). The

440 negative effects found in the literature regarding specific strategies such as expressive  
441 suppression could refer to limited repertoires of strategies (e.g, over reliance on a specific  
442 strategy) or to the association with other strategies that do not help to down-regulate negative  
443 emotions (e.g., rumination). Second, targeted intervention programs can be developed in line  
444 with the specific needs of particular adolescents, beyond a universal prevention approach.  
445 Within a person-oriented approach, adolescents could benefit from programs addressing the  
446 effectiveness of specific aspects of abilities related to the pursuit of regulation goals (e.g.,  
447 Cummings et al., 2023; Modecki et al., 2017). These programs could focus on different  
448 components of emotion regulation flexibility such as: (1) expanding the repertoire of strategies  
449 (e.g., using role-playing exercises with adolescents so they can try out alternative ways of doing  
450 things), and (2) developing the context sensitivity component by focusing on the constraints  
451 and challenges induced by different emotional contexts (e.g., interpersonal, academic).

452 *Using different time scales for evaluating emotion regulation strategies and abilities in*  
453 *adolescence*

454       Emotion regulation unfolds over a relatively short period of time, with significant  
455 changes depending on the course of an event: adolescents may begin by using a strategy to deal  
456 with an unpleasant event such as a parent's admonition (e.g., expressive suppression), and use  
457 another one later when the conversation is over by discussing it with friends (e.g., support  
458 seeking). The strategies used by adolescents also may change with age. In the previous example,  
459 young adolescents receiving a bad grade may use support seeking, for example by looking for  
460 peers who obtained similar grades. As they get older, they may shift to other strategies such as  
461 reappraisal, for example by minimizing the importance of this particular grade. This change  
462 refers to different sources of temporal variability in adolescent development. Hollenstein and  
463 Lanteigne (2018) argued that emotion regulation is a process that involves different time scales:  
464 the real-time scale where emotion regulation unfolds (e.g., using multiple emotion regulation

465 strategies when dealing with an emotional event), and the developmental time scale (e.g.,  
466 changes in the processes involved in emotion regulation over the course of months or years).  
467 Within this perspective, the real-time processes form the developmental-time structures and  
468 these developed structures subsequently constrain future real-time processes. We believe that  
469 this dynamic system approach is crucial in the study of emotion regulation and even more for  
470 understanding its development during adolescence.

471 In this dynamic system approach, the emotional changes experienced during  
472 adolescence (e.g., dealing with the impact of puberty) may occur at any time, at different ages  
473 which is especially meaningful for the development of goal-pursuit abilities in adolescence.  
474 These new settings also may introduce expectations for social interactions that adolescents have  
475 to follow as they switch from one context to another (e.g., from school to home). Thus,  
476 adolescents may exhibit typical variability in the use of emotion regulation strategies or show  
477 emotion polyregulation patterns that would be used less by adults who had already experienced  
478 similar events.

479 Combining these interdependent time scales is essential to piece together the  
480 development of emotion regulation in adolescence. In this perspective, using real-time emotion  
481 regulation measures nested within longitudinal measures is required. Studies that focus on the  
482 development of specific emotion regulation goal-pursuit abilities such as emotion  
483 polyregulation should be conducted using these two different time scales. The microlevel (real-  
484 time) time scale helps evaluating whether emotion polyregulation is concurrent or sequential,  
485 which requires specific designs such as the Ecological Momentary Assessment (see Lennarz et  
486 al., 2019 or Smith et al., 2022 for studies conducted with adolescents; Grommisch et al., 2020  
487 for a study focused on polyregulation with adults). The macrolevel (developmental) time scale  
488 contributes to describing how this ability develops throughout adolescence, which and involves  
489 designs repeating phases of intensive longitudinal measures (e.g., several intensive phases per

490 year for several years). Such studies also examine interindividual differences in emotion  
491 regulation development and clarify why some adolescents develop their repertoire of emotion  
492 regulation strategies sooner than others.

493 *Combining different methods for assessing emotion regulation in adolescence*

494         The use of both experimental measures and self-report and other-report measures would  
495 extend our knowledge on the development of emotion regulation strategies and abilities and  
496 would be a definite strength for studies on emotion regulation. Self-report and other-report  
497 measures are used widely to evaluate emotion regulation in adolescence. They are critical for  
498 understanding how emotion regulation unfolds in everyday life. However, they have  
499 limitations: adolescents can encounter difficulties in positioning themselves on scales or  
500 accessing implicit emotion regulation (Sperduti et al., 2017), these measures are susceptible to  
501 social desirability, and they lack precision to evaluate the processes involved in the  
502 implementation of strategies as well as their effectiveness. Direct measures (e.g., observation,  
503 experimental tasks) are suited better to assess adolescents' efficiency at implementing various  
504 emotion regulation strategies (i.e., emotion regulation ability), to compare their efficiency, and  
505 to highlight age differences in the ease of their use. Studies have been conducted that request  
506 adolescents to use specific emotion regulation strategies (e.g., Theurel & Gentaz, 2018).  
507 Although useful, these measures are not suited to evaluate the use of emotion regulation  
508 strategies in daily situations, and they cannot assess how adolescents regulate their emotions  
509 depending on the context. Indeed, observation protocols struggle to evaluate cognitive  
510 regulation strategies whereas experimental tasks can do it but often lack ecological validity. To  
511 address these limitations, designs using both approaches may be useful to apprehend relations  
512 between specific emotion regulation processes like emotion intensity and emotion  
513 polyregulation. Investigating this issue would be particularly informative to understand whether

514 the use of emotion regulation strategies in everyday situations is related to the ability to  
515 implement the same strategies.

516 *Focusing on both predictors and outcomes of emotion regulation in adolescence*

517 Emotion regulation is often considered as a psychosocial adjustment variable. However,  
518 the development of emotion regulation is related to emotional, cognitive and social changes  
519 that occur in adolescence. Given the implications of emotion regulation in adolescents' socio-  
520 emotional life, a more comprehensive view of both predictors and outcomes of emotion  
521 regulation strategies and abilities is necessary. Most studies on emotion regulation do not rely  
522 sufficiently on the conceptual distinctions existing in the emotion regulation literature, nor on  
523 the influence of different contexts on the development of emotion regulation in adolescence.

524 Cognitive development, and more specifically executive functions, also are associated  
525 with emotion regulation. This is especially the case during adolescence when using emotion  
526 regulation strategies (i.e., rumination, suppression, and reappraisal; see Schweizer et al., 2020  
527 for a review). For instance, excessive rumination is associated with difficulties in inhibiting  
528 repetitive negative thinking (Gotlib & Joormann, 2010). Although emotion suppression implies  
529 the inhibition of emotional expressions (Chervonsky & Hunt, 2017), reappraisal requires  
530 working memory to update the interpretations of emotional experiences, thoughts, and events  
531 (Aldao et al., 2010). Recent advances in the literature (i.e., Pruessner et al., 2020) point the lack  
532 of studies in this field, and suggest that interindividual differences in executive functioning also  
533 are related to the development of complex goal-pursuit abilities such as emotion regulation  
534 flexibility. In their model, Pruessner et al. (2020) argue that inhibition, set-shifting, and  
535 updating all contribute specifically to particular aspects of emotion regulation flexibility. Given  
536 the theoretical and empirical connections between executive functions and emotion regulation,  
537 longitudinal research would explain how the development of executive functions contributes to

538 age-related changes in the efficiency of implementing emotion regulation strategies, in the use  
539 of these strategies in emotional contexts and in goal-pursuit abilities.

540 As presented earlier, parents are major partners and contributors to how adolescents  
541 develop emotion regulation (Morris et al., 2017). Adolescents' emotion regulation experiences  
542 in relation with their parents partly may be similar in other contexts (e.g., romantic or peer  
543 relationships). There is currently little data on how these contexts influence the development of  
544 the different aspects of emotion regulation. To evaluate whether differences in parental  
545 practices and in the emotional climate of the family predict interindividual differences in  
546 emotion regulation over time, longitudinal studies from childhood to early adulthood are  
547 required. Evaluating simultaneously whether parental influences affect the development of  
548 emotion regulation abilities and the daily use of strategies in various contexts would be  
549 informative for both researchers and psychologists. Finally, peer relationships are one of the  
550 contexts that drive the development of goal-pursuit abilities and also must be considered.  
551 Emotion regulation flexibility is needed as adolescents interact with peers in multiple contexts  
552 (e.g., school, social media, extracurricular activities). Similarly, polyregulation arises as new  
553 emotionally intense situations (e.g., romantic relationships) occur with peers in adolescence.

#### 554 **Conclusion**

555 Emotion regulation undergoes many developmental changes during adolescence. In this  
556 article, we provided a framework for research on emotion regulation development, based on the  
557 review of changes adolescence experience in relation to existing models and research. We  
558 particularly focused on making theoretical distinctions that are still rare, notably between  
559 emotion regulation strategies and abilities, and pointed out current gaps in the literature. This  
560 analysis led to the development of promising avenues for research. Empirical studies need to  
561 go further by shifting from static to more flexible, dynamic, and contextualized views of  
562 emotion regulation. Indeed, current knowledge on emotion regulation development in



563 adolescence remains quite limited and contested. To provide a better understanding of the  
564 aspects of emotion regulation development, we stress the need for researchers to rely on up-to-  
565 date conceptual advances (by adopting a more contextualized approach and distinguishing  
566 between emotion regulation strategies and abilities), to use a person-oriented approach, to  
567 combine different time scales and methods, and to address the major issues of both predictors  
568 and outcomes of emotion regulation. Conducting such studies in the upcoming years constitutes  
569 a necessary perspective for both researchers and psychologists who work with adolescents.  
570 Expanding our knowledge of emotion regulation in adolescence will have strong clinical and  
571 public health implications in designing effective interventions and may help prevent typical  
572 adolescent problematic behaviors such as poor decision making.

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