

Regular Article

Real-world flexibility in adolescent girls' emotion regulation strategy selection: An investigation of strategy switching

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Abstract

Adolescence is an important stage for the development of emotion regulation skills, especially for adolescent girls who are at elevated risk for the development of depression and anxiety. Although some emotion regulation strategies are more effective at helping adolescents regulate negative affect on average, research indicates strategy effectiveness varies with the context in which a strategy is deployed. Yet less work has been done examining which contextual factors are associated with adolescents *switching* emotion regulation strategies in their daily lives. This study examined individual and contextual factors related to negative interpersonal events that are associated with strategy effectiveness, including age, emotional intensity, perceived controllability, and co-regulatory support, and their association with adolescent emotion regulation strategy switching in daily life via ecological momentary assessment. Results indicated that adolescent girls differed in the degree to which they altered their emotion regulation strategies throughout their daily lives, and that switching strategies was associated with age as well as individual and within-person differences in perceived controllability, emotional intensity, and co-regulatory support. This study provides critical proof-of-concept of the utility of emotion regulation strategy switching as a measure of regulatory flexibility and highlights regulatory processes that may hold clues to the mechanisms of developmental psychopathology.

Keywords: adolescence; coping theory; ecological momentary assessment; emotion regulation flexibility; strategy selection

(Received 4 February 2022; revised 12 September 2022; accepted 14 September 2022; First Published online 12 December 2022)

Adolescence is a developmental period marked by multiple physical, emotional, and social changes, occurring at a pace exceeded only by that of infancy and early childhood. Compared to children and adults, adolescents are acutely attuned to social and emotional information, exhibiting greater sensitivity to both social reward and social rejection (Blakemore & Mills, 2014; Crone & Dahl, 2012; Silvers et al., 2012). Further, adolescents' first forays into adult-like roles, such as romantic relationships and formal employment, raise the stakes for adolescent independent emotion regulation, as a poorly managed outburst may lead to the dissolution of a relationship or termination of employment. Thus, the development of emotion regulation skills that are well-matched to various contexts is critical for the successful navigation of these rapid changes. Additionally, as emotion regulation difficulties are prospectively associated with psychopathology in adolescence (McLaughlin et al., 2011), these skills are especially important for adolescent girls, who experience the onset of psychopathology – particularly depression and anxiety – at rates significantly higher than adolescent boys (Hankin et al., 2015).

Multiple theoretical models of emotion regulation have been proposed (Gross, 2015; Koole, 2009; Southam-Gerow & Kendall, 2002). Among other automatic and effortful processes, most

theories include an effortful process by which individuals attempt to down- or up-regulate a prepotent emotional reaction, typically described as the deployment of emotion regulation *strategies*. Common emotion regulation strategies (henceforth, *strategies*) have emerged from the adult psychopathology literature (Aldao et al., 2010). Several strategies, including problem solving, cognitive reframing/reappraisal, and acceptance are broadly adaptive and protect against psychopathology in adulthood (Aldao et al., 2010). Conversely, several strategies, including rumination and cognitive and behavioral avoidance, confer greater risk for psychopathology.

The effectiveness of emotion regulation strategies in adolescence broadly mirrors the adult literature, as evidenced by two recent meta-analyses in children and adolescents (Compas et al., 2017; Schäfer et al., 2017). In one recent meta-analysis that focused on adolescents ages 13–18 and examined associations between emotion regulation strategy use and internalizing psychopathology, the strategies typically found to be adaptive in adult samples – cognitive reappraisal, problem solving, and acceptance – were all found to be inversely associated with internalizing psychopathology, broadly, and with depressive and anxiety symptoms, specifically (Schäfer et al., 2017). On the other hand, the typically maladaptive strategies of avoidance, suppression, and rumination were positively associated with internalizing psychopathology and anxiety and depressive symptoms. In addition to these strategy-specific findings, empirical work also supports that emotion regulation – broadly operationalized – is associated with

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Cite this article: McKone, K. M. P., et al. (2024). Real-world flexibility in adolescent girls' emotion regulation strategy selection: An investigation of strategy switching. *Development and Psychopathology* 36: 181–195, <https://doi.org/10.1017/S0954579422001079>



psychopathology (Compas et al., 2017) cross-sectionally and longitudinally (McLaughlin et al., 2011).

However, some preliminary findings suggest that developmental differences may influence the *selection*¹ of emotion regulation strategies during adolescence. Adolescents ages 12–15 use more maladaptive (and fewer adaptive) emotion regulation strategies, compared to younger children/preteens and older adolescents (Cracco et al., 2017). Further, capacity for the cognitively demanding strategy of reappraisal increases with age (Silvers et al., 2012) and neural evidence indicates younger adolescents may be less successful at effectively down-regulating emotional information via reappraisal (Silvers et al., 2015). Taken together, these findings suggest that there may be increasing capacity for affective control (and, by extension, regulation) throughout adolescence (Schweizer et al., 2020). In line with these findings, one study leveraging ambulatory methods found age-related differences in the effectiveness of cognitive reappraisal in late adolescence (ages 17–19); intriguingly, cognitive reappraisal was associated with *increased* negative affect in this age group, whereas for young adults, reappraisal was associated with decreases in negative affect typically found in adult samples (Brockman et al., 2017). Finally, a recent meta-analysis found that associations between emotion regulation strategies and various forms of psychopathology were stronger in adolescence compared to childhood (Compas et al., 2017; Schäfer et al., 2017). Taken together, these findings indicate that the developmental and contextual changes of adolescence may drive adolescents of different ages to select and deploy emotion regulation strategies at different rates in their daily lives.

Environmental considerations for strategy selection

Although various strategies may be (mal)adaptive on average, a key consideration in a given strategy's effectiveness in the moment is how well it is matched to the situation in which it is deployed, a conceptualization often referred to as *emotion regulation flexibility* (Aldao et al., 2015). For example, although problem solving is typically adaptive, an individual who rigidly attempts to problem-solve a situation that is outside of his or her control, such as a parental harshness or depression, may ultimately end up increasing his or her distress, rather than alleviating it. Instead, a more flexible response of switching to acceptance- or reframing-based strategies focused on one's response to uncontrollable emotionally evocative events may be more adaptive. This is particularly relevant for children and adolescents, who typically have less control over their environment than adults. Indeed, research on coping, which shares conceptual overlap with emotion regulation albeit at a longer timescale, indicates that the application of a problem-focused strategy (e.g., problem solving) in the face of an uncontrollable stressful situation may result in *increased* distress in youth (Compas et al., 2001). Conversely, adults who exhibited high levels of cognitive reframing (an emotion-focused strategy) in primarily *controllable* situations that may be handled more effectively with problem-focused strategies exhibited higher levels of depressive symptoms compared to those who reframed such situations less frequently (Troy et al., 2013). It is worth noting, however, that

¹Throughout this manuscript, we will use "strategy selection" to indicate strategies used by adolescents regardless of the effectiveness of the strategy, "strategy effectiveness" to indicate the effectiveness of a given strategy when used (typically across contexts, but sometimes in a specific context), and "strategy switching" to indicate switches between strategies from timepoint to timepoint, irrespective of the effectiveness of such switches. Strategy switching is treated as a special case/specific operationalization of strategy selection (i.e., circumstances in which an adolescent selects a different strategy at one timepoint compared to the previous timepoint).

altering one's strategy from situation to situation may not always be more adaptive, even if the context changes. Sometimes an individual needs to *persist* in a strategy in order for it to work, which may be particularly pertinent for adolescents, who may still be developing their regulatory skills and repertoires.

Researchers in the developmental stress and coping literature have identified four categories of coping strategies that attempt to reflect differences in strategy effectiveness based on the context (Compas et al., 2001). This captures a rough approximation of flexibility in strategy use, when applied to day-to-day scenarios. Primary control strategies (e.g., problem solving) attempt to directly eradicate the stressor and are most effective when the stressor is under the individual's control, whereas secondary control strategies (e.g., reappraisal, acceptance), which are focused on altering one's emotional response to a stressor, are theorized to be most effective for uncontrollable stressors, and lab-based studies in adults support this notion (Troy et al., 2013). Disengagement strategies, in which the individual attempts to avoid the stressor, and involuntary engagement strategies, in which the individual reflexively dwells on the stressor negatively and repetitively (e.g., rumination), are thought to be ineffective regardless of the nature of the stressor. Lab-based, cross-sectional studies indicate that disengagement and involuntary engagement strategies are more likely to be deployed in situations with higher emotional intensity (Sheppes et al., 2011). Although a full review of the similarities and distinctions of emotion regulation and coping as theoretical constructs is outside the scope of this report, see Compas et al. (2017) for an in-depth consideration of these issues. In brief, the emotion regulation strategies assessed here are frequently examined in both the emotion regulation and coping literatures (Compas et al., 2017). The category groupings used in this report are supported by empirical evidence (Connor-Smith et al., 2000) and have been used in other ecological momentary assessment (EMA)-based examinations of emotion regulation strategy use (e.g., Silk et al., 2003).

The context-dependent differences in strategy *effectiveness* emerging from cross-sectional studies imply that there may be differences in adolescent strategy *selection* depending on the context as well. Adolescents may switch between different strategies dynamically, based on the emotional intensity or controllability of a given stressor or whether the adolescent receives co-regulatory support during their regulatory efforts. However, little longitudinal work has examined whether adolescents are actively altering their strategy selection based on context, and it is unknown whether broad associations between strategy use and context translate to momentary experiences in the real world. With the increased use of experience-sampling methods such as EMA, a recent emphasis in emotion regulation research has been evaluating emotion regulation strategy use in the real world and examining aspects such as strategy-situation fit and effectiveness (Brans et al., 2013; Brockman et al., 2017; Lennarz et al., 2019). To date, only one study has examined the influence of contextual factors on strategy *selection* in the real world in adolescents. Lennarz et al. (2019) examined the effects of emotional intensity on strategy selection, finding that adolescents were more likely to report using acceptance in low-intensity situations, whereas a wide range of strategies were used in response to high intensity emotion. However, emotional intensity was the only factor examined. It is also important to examine whether other contexts that are associated with more (or less) use of specific strategies in global reports – like receipt of co-regulatory support and perceived controllability of the situation – actually do influence adolescent strategy selection in daily life.

Despite the dearth of studies in adolescent samples, several studies have examined strategy selection in daily life in samples of adults, which indicate that (a) aspects of the context are influential on which strategies adults deploy (English et al., 2017), and (b) adults' flexibility in strategy use changes as they age (Benson et al., 2019). Most pertinent to the current study, Haines and colleagues (Haines et al., 2016) found that, although there were no broad associations (across all people and situations) between higher levels of cognitive reappraisal and well-being, adults with higher levels of well-being used more reappraisal in less controllable situations. Similarly, in a daily diary study, Brown et al. (2021) found that higher levels of emotional intensity during a day's negative events were associated with higher rates of endorsement of avoidance, distraction, and social support, but not problem solving. Finally, in an event-based daily diary study examining emotion regulation strategy use in the work context, Scheibe and Moghimi (2021) found that higher levels of emotional intensity were associated with less use of reappraisal and acceptance, but not greater use of distraction. Notably, many of the studies in adults examined only a few strategies (e.g., reappraisal and suppression), and often examined just one contextual factor (e.g., controllability). Despite these limitations, there is converging evidence of the importance of emotion regulation strategy flexibility in daily life as it relates to individual well-being (Benson et al., 2019; Blanke et al., 2020; Conroy et al., 2020).

Influences on strategy selection: between- and within-person factors

The effects of the situation or context on strategy selection may be driven by dispositional differences between individuals (i.e., between-person processes) or may shift depending on change for an individual compared to their baseline (i.e., within-person processes). For example, it may be that those individuals who *on average* experience events as more distressing are more likely to select one strategy (e.g., rumination) over another. Conversely, it may be *increases in emotional distress from an individual's average levels* that lead to the selection of a given strategy. To our knowledge, no studies have yet examined these questions, despite indications from the cross-sectional literature that suggest potential effects at both levels.

At the between-person level, one factor that may influence strategy selection is age. Younger adolescents may use different strategies than older adolescents, either due to differences in effectiveness of these strategies at various ages, or related to developmental differences in cognitive ability (Brockman et al., 2017; Cracco et al., 2017; Schweizer et al., 2020; Silvers et al., 2012). Further, dispositional differences in the extent to which adolescents perceive events as controllable may influence which strategies they select. For example, adolescents who typically perceive events as less controllable on average may deploy more strategies focused on modulating their emotional response, rather than actively engaging with the stressor (Band & Weisz, 1988). Similarly, between-person differences in how intense a negative event is perceived to be may be related to which strategies are employed, as a higher intensity of emotion experienced may be associated with the use of more involuntary engagement or avoidance/escape-related strategies.

At the within-person level, emotional intensity is likely especially important in adolescence as it relates to strategy selection (Lennarz et al., 2019). Typical developmental increases in affective salience (Crone & Dahl, 2012) may lead to bigger "swings" in

emotional intensity for adolescents, resulting in periods of increased emotional intensity. Similarly, the effects of the controllability of a stressor may be especially important in adolescents' daily lives. Although adolescents typically gain independence throughout this developmental stage, they are still largely bound by the strictures of their parents, teachers/administrators, and other adults, and hence may encounter a higher number of stressors that they perceive as uncontrollable. As adolescents experience stressors over which they perceive different levels of control during their daily lives, they may modify their regulatory approach accordingly, leveraging proactive strategies like problem solving in more controllable situations and more emotion-focused strategies like acceptance, reframing, or rumination in less controllable situations. Finally, the presence or absence of co-regulatory support in the moment may also be a critical factor in an adolescent's selection of an emotion regulation strategy and whether they change in which strategy they use from one instance to the next. Adolescents often depend on parents or friends to assist them with challenges in novel situations or to identify potential solutions (e.g., Waller et al., 2014). This co-regulatory support may facilitate the use of strategies an adolescent may not think of or employ otherwise, increasing the likelihood that an adolescent would switch strategies from a strategy more often used. Further, co-rumination is a well-documented phenomenon in adolescent girls' regulatory experience, in which individuals engage in rumination as a dyadic process, dwelling on emotional distress and/or the distressing situation together (Schwartz-Mette & Rose, 2012). As the ruminative process may be initiated by either interaction partner, it may be that having co-regulatory support encourages some girls to engage in rumination, even when rumination is not a typical regulatory approach for them, leading to increased likelihood of switching.

In addition to these context-related influences on strategy selection in daily life, it is unknown whether adolescents switch between multiple strategies during their daily lives and whether there are individual differences in the number of strategies used and/or the frequency with which individuals switch between strategies. For example, it is plausible to imagine one adolescent who flexibly switches between five or six strategies in response to the changing context versus another adolescent who primarily employs one or two strategies despite similar contextual changes. These individual differences in strategy selection may have important implications for how well adolescents are able to adapt and function in their changing and expanding social roles. Ultimately, these individual differences in strategy selection may set adolescents on or deflect them from a path to the development of psychopathology.

Operationalizing strategy selection

Investigating flexibility in strategy selection using momentary methods poses several methodological challenges, including issues of multiple comparisons and questions of how to operationalize strategy-situation fit. Some reports have addressed these challenges by examining variability in just one or two strategies (assessed on a continuous scale) in conjunction with one or two contextual factors; for example, Benson et al. (2019) examined variability and covariation in expressive suppression and cognitive reappraisal in the contexts of emotional closeness vs. non-closeness and the emotional context of the situation (happy vs. sad). Others have leveraged intraindividual variability measures for categorical data, such as dispersion, which capture the extent to which an individual changes in their emotion regulation *repertoire* over time (Eldesouky & English, 2018). Although both of these methods

provide insight into emotion regulation flexibility processes, they are limited in their ability to assess change across multiple types of strategies and a range of contexts simultaneously.

One novel method that may provide insight into adolescent emotion regulation strategy selection comes from the emotion literature. Recently, studies have examined the extent to which individuals engage in emotion switching, or shifting from one affective state to another (e.g., from positive affect to negative affect and vice versa; Houben *et al.*, 2016), also referred to as *switching propensity*. As switching propensity studies are focused on factors that result in *change* in the strategy deployed, when applied to emotion regulation strategy selection, switching propensity may provide insight into the contextual factors that are related to an individual shifting from one strategy to another in a given moment.

The current study

The current study examines emotion regulation flexibility via EMA in a sample of adolescent girls enriched for risk for internalizing disorders using a novel emotion regulation strategy switching approach. We focused on emotion regulation in the context of negative interpersonal interactions, given the high affective salience of these experiences in adolescence, and for adolescent girls in particular (Blakemore & Mills, 2014). We were guided by three primary research questions. First, do adolescent girls exhibit significant variability in emotion regulation strategy use, as measured via strategy switching, and are there individual differences in variability in strategy use? Second, does emotion regulation strategy switching vary as a function of age? Third, do individuals alter their strategy use based on contextual factors (i.e., flexibility), such as receipt of co-regulatory support, intensity of emotion, or perceived controllability, both on average and from timepoint to timepoint? These questions were addressed both in terms of overall variability in strategy switching (overall strategy switching) as well as through examination of switches to primary control, secondary control, disengagement, and involuntary engagement strategies, in line with the prominent theories of coping discussed above.

Hypotheses

We hypothesized that girls would be more likely to switch emotion regulation strategies over time on average versus using the same strategy from timepoint to timepoint (i.e., significant intercept; hypothesis 1.1), and girls would differ in the extent to which they switched strategies over time (i.e., significant random effect of person; hypothesis 1.2).

Between-person associations

Based on the reviewed evidence of age-based differences in emotion regulation strategy effectiveness and developmental changes in affective control, we hypothesized that overall variability in emotion regulation strategy switching (i.e., propensity to change from any one strategy to any other strategy from timepoint to timepoint) would increase with age (hypothesis 2.1). We further hypothesized that individuals who tend to experience greater emotional intensity on average following a negative interaction would also tend to vary more in their emotion regulation strategy switching (i.e., exhibit a higher switch propensity across all strategies; hypothesis 2.2).

Within-person change

At the within-person level, consistent with cross-sectional, questionnaire-based findings on coping and emotion regulation strategy use (Compas *et al.*, 2001), we hypothesized that as an adolescent's perceived control over a stressor *increased* from timepoint to timepoint, they would be more likely to switch to a primary control strategy (hypothesis 3.1.1), and less likely to switch to a secondary control strategy (hypothesis 3.1.2). Additionally, as the emotional intensity of a stressor increased from timepoint to timepoint, a given adolescent would be more likely to switch to a disengagement strategy (hypothesis 3.2.1) or to involuntary engagement (hypothesis 3.2.2). Finally, receipt of co-regulatory support in the moment would be associated with greater propensity to switch to a primary control emotion regulation strategy (hypothesis 3.3).

Method

Participants

One hundred and fourteen participants ($M_{\text{age}} = 12.26$ years, 67.5% white) were included in analyses for the current study. Participants were drawn from a longitudinal study of emotional, social, and neural factors related to the development of social anxiety and depression in adolescent girls (see Sequiera *et al.* [2021] for additional information on recruitment). The full sample was comprised of 129 adolescent girls ages 11–13, with two-thirds recruited to be at high risk for social anxiety and depression based on participants' temperament scores on the Early Adolescent Temperament Scale – Revised (EATQ-R; Ellis & Rothbart, 2001). This sample size was selected as it would afford adequate power to detect medium effects for the primary aims of the study, which were related to neural sensitivity to social threat and responsiveness to social reward. High risk was indicated by a score of 0.75 *SD* above the mean on either the Fear or Shyness subscale based on parent or adolescent report. Pertinent study exclusion criteria included: current or past DSM-5 diagnosis of major depressive disorder or an anxiety disorder (except specific phobia); IQ < 70; diagnosis of psychotic disorder or autism spectrum disorder; any neurological or serious medical conditions; presence of MRI contraindications (braces, metal in body); psychoactive or endocrine disrupting medications (except stimulants); acute suicidal risk. Please see below for information on the final sample for analysis.

Procedure

The larger study comprised three waves of data collection. The first wave, from which the current analysis was drawn, involved three laboratory visits: (a) a clinical interview, (b) a series of dyadic interaction and individual tasks, and (c) an fMRI scan. Prior to their first laboratory visit, adolescents and a participating parent completed a battery of self-report questionnaires online. Additionally, between the second and third laboratory visits, a 16-day EMA protocol was conducted. As this project pertains solely to the online questionnaires and EMA protocol, no other study procedures will be described in detail.

After the second laboratory visit, the adolescent was given a study cell phone and instructed on how to complete the EMA protocol using the Web Data Express app. Over the course of 16 days, participants were sent three prompts on weekdays and four prompts on weekend days, for a total of 54 prompts over the 16-day sampling period. The morning prompt time was set by the participant based on their typical wake-up time. No prompts

were sent during the school day, so the remaining two prompts were randomly sent after the participant's reported school end time. Each prompt asked the participant to report what she was doing at the current moment, her current emotions, and who she was with. In addition, the participant was asked to report on the most negative interaction she had had with other kids her age since the last prompt. Participants were asked to "Think about the interaction with other kids your age that made you feel the worst since the last beep on [last sampling time]. What happened?" If participants were unable to come up with a situation, they could mark "I am having trouble thinking of something". Marking this option presented participants with a prompt intended to aid them in identifying a situation: "Sometimes it helps to think about what happened since the last beep. What were you doing when you completed the last beep? What have you been doing since then? During that time, who did you talk to? What did they say? Also, sometimes little things can get under your skin. Was there anything minor that happened that bugged you, like somebody said or did something that annoyed you, hurt your feelings just a little, or disappointed you. It's ok if you write about something that wasn't a big deal. Did this help you think of something? (If so, type below)." If participants were still unable to identify a situation they could mark "No. I still can't think of anything." They were then asked why, with two options, "I did not have any interactions with other kids my age since the last beep" and "I had interactions with kids my age since the last beep, but nothing made me feel even a little bit bad." They were then prompted to "Then think about the last interaction that made you feel bad that you had with any other person. What happened?" with no option to skip this final question. As such, participants were required to supply a negative interaction at each prompt. After entering their negative interaction, participants were prompted to describe when the interaction occurred, the context of the interaction (e.g., in person, online), and whom they were with during the interaction (e.g., friends, boyfriend/girlfriend). Finally, participants were asked to report on their emotional response and any emotion regulation strategies they used to cope with negative affect, as described below.² Surveys expired after 1 hr.

Measures

Emotion regulation strategy use

After reporting their most recent negative social interaction, the participant was asked, "Did you react in any of the following ways? (choose the one response that fits best)." The participant could choose one strategy from nine options that captured a range of regulatory strategies and had been adapted for the study based on Silk et al. (2003)'s and Tan et al. (2012)'s emotion regulation EMA items: (a) acceptance ("I realized I just had to live with things the way they are"); (b) problem solving ("I did or planned something to make things better"); (c) support seeking ("I talked to someone about it"); (d) reframing ("I tried to think of the problem in a different way so it didn't seem as bad"); (e) cognitive avoidance ("I tried not to think about it or to forget all about it"); (f) emotional expression ("I cried or showed emotion another way"); (g) rumination ("I kept thinking about how bad I was feeling or how bad the situation is"); (h) behavioral avoidance ("I tried to avoid being

around the people or situation that was bothering me"); or (i) none of the above ("I didn't do any of these things").

Emotion regulation flexibility

Flexibility in emotion regulation strategy use was operationalized in two ways, using an emotion regulation switching approach, similar to that used in Houben and colleagues (Houben et al., 2016). First, gross flexibility was operationalized as a switch from any one strategy to a different strategy at the next timepoint. Second, to further elucidate when and why adolescents switch to one strategy versus others, emotion regulation strategies were grouped according to Compas et al.'s (2001) response to stress framework to create four categories of switches to: (a) a primary control strategy (problem solving, support seeking, emotional expression); (b) a secondary control strategy (acceptance, reframing); (c) a disengagement strategy (cognitive avoidance, behavioral avoidance); or (d) involuntary engagement (Brans et al., 2013; Silk et al., 2003).

To facilitate these analyses, a series of dummy codes was created. First, dummy codes were created for each strategy, such that $I = 1$ if used the strategy at the given timepoint and $0 = 0$ if used any other strategy at the given timepoint. A second set of dummy codes were created according to the Compas et al.'s (2001) response to stress framework as outlined above. For example, for the primary control category, $I = 1$ if used a primary control strategy at T_0 and $0 = 0$ if used a strategy from any other category at T_0 . The response option "I didn't do any of these things" was included in the reference group for all strategy/category dummy codes but was not used as a separate switching category (i.e., switches to "I didn't do any of these things" were not examined). In addition to allowing the data from those observations to be leveraged in multilevel models, this approach also facilitated inclusion of switches from the "I didn't do any of these things" response option in the gross variability analyses. As it is possible that participants were engaged in a different strategy not assessed, this allowed us to capture more of participants' switching behavior. However, as "I did not do any of these things" may also reflect a *lack of regulation* or the use of strategies that may have fallen into one of our categories but that were not assessed (e.g., distraction, suppression) we did not consider it to be a separate category in category switching analyses.

To operationalize switches, five dummy codes were created. For the gross flexibility measure, a switch was coded whenever a participant reported using a different strategy at the current timepoint (T_0) compared to the previous timepoint (T_{-1}), regardless of the larger category of that strategy (i.e., primary control, secondary control, etc.). As an example, a participant who reported using reframing at T_{-1} and acceptance at T_0 would be coded as a switch at T_0 , whereas a participant who reported using reframing at T_{-1} and at T_0 would not be coded as a switch at T_0 . Four dummy codes were created for the category analyses, each representing a switch to the given category, with a switch coded when a participant reported using a different category of strategy at the current timepoint (T_0) compared to the previous timepoint (T_{-1}). For example, a participant who reported using reframing (coded as a secondary control strategy) at T_{-1} and problem solving at T_0 (coded as a primary control strategy) would be coded as a primary control switch at T_0 . By contrast, a participant who reported using support seeking at T_{-1} and problem solving T_0 (both coded as primary control strategies) would not be coded as a primary control switch at T_0 .

Emotional intensity

After reporting the details of their most recent negative peer interaction, the participant was then asked to report the extent to which

²Some participants reported interactions that were not with peers their age, instead reporting on interactions with parents or relatives. As we did not have specific hypotheses about the processes examined here with regard to peer vs. non-peer events, all valid interactions reported were included.

they felt four negative emotions in response to the event: anger, worry, sadness, and stress. Each emotion was rated on a visual analog sliding scale from 0 = *Not at all* to 100 = *Extremely*. Multilevel reliability estimates indicated adequate reliability across the four emotions ($\alpha_{\text{within}} = .64$ and $\alpha_{\text{between}} = .88$). Emotional intensity was person-mean centered to facilitate examination of within-person effects, with individual person-means included to examine between-person effects.

Co-regulatory support

After reporting the emotion regulation strategy used, adolescents were asked, "Did anybody help you, encourage you, or participate with you in this reaction?" with the response options (a) nobody, (b) a friend or friends, (c) mother or stepmother, (d) father or step-father, (e) sibling(s) or step-sibling(s), (f) other. For the purposes of this study, within-subject in-the-moment co-regulation was dichotomized such that 0 = *did not engage in co-regulation* and 1 = *engaged in co-regulation* at a given sampling occasion. Between-subjects co-regulatory support was centered at the sample average percent of occasions in which co-regulation occurred, 34%.

Perceived controllability of interaction

In reference to their most recent negative social interaction, participants were asked "How much control did you feel you had over the situation?" and responded using a visual analog scale from 0 = *No control* to 100 = *Complete control*. Perceived controllability was person-mean centered to examine within-person effects, with person-means included to examine between-person effects.

Covariates

Adolescent age (to the day) was included as a group-mean centered covariate. Adolescent race was self-reported and dichotomized such that 0 = White, 1 = non-White.³ Pubertal development was self-reported using the Pubertal Development Scale (Petersen et al., 1988), operationalized in accordance with Shirtcliff and colleagues' updated formula (PDSS total score; Shirtcliff et al., 2009; $\alpha = .78$) and group-mean centered, with higher scores indicating more advanced levels of pubertal development.

Dispositional fearfulness and shyness. As the sample included was oversampled for risk for internalizing disorders based on elevated shy and fearful temperament, we included parent-reported dispositional fearfulness and shyness as a covariate. Dispositional fearfulness and shyness were operationalized as sum scores from the fear and shyness subscales, respectively, of the EATQ-R (Ellis & Rothbart, 2001), which was completed as part of the online questionnaire portion of the study. Reliabilities were low-to-moderate ($\alpha = .66$) for fearfulness and high ($\alpha = .87$) for shyness. Fearfulness and shyness were group-mean centered.

Analytic approach

First, data were inspected for compliance and errors. One hundred and twenty-eight participants participated in the EMA portion of the study with 54 possible observations per participant, resulting in

³We recognize that dichotomizing race in this fashion perpetuates a perception of White individuals as the default racial reference group and elides many potentially important differences in experience between racial groups. However, although our sample is broadly representative of the region in which it was collected, the sample sizes of individual racial groups are too small to responsibly conduct sensitivity analyses of any potential group differences. As a result, we are including race as a covariate in analyses but will not interpret any significant group differences beyond reporting the associations in the results.

a total of 6,912 possible observations. One participant withdrew from the lab visit prior to the EMA protocol, four participants did not meet minimum response requirements during the EMA protocol (i.e., 25% completion), and four participants withdrew from this portion of the study and were therefore excluded. Data from two participants was lost to technological malfunction. Prompts that went unanswered were considered missing ($n = 1,307$; 20.6% of valid calls). Additionally, negative interaction events where the emotion rating was less than 10 (out of 100) were excluded from analyses for two purposes. First, as this was an examination of emotion regulation response, it was important that events elicit more than a negligible emotional response. Although previous EMA studies of emotion regulation (Silk et al., 2003) have used cutoffs of 3 on a 1–5 scale (corresponding to 60 on the 0–100 scale), as we were interested in potential differences in the selection of a given strategy versus another based on the level of emotional intensity elicited, differences occurring even at low levels of emotional intensity were of theoretical interest. Second, participants were required to provide a negative interaction for each prompt (i.e., there was no way to skip, leave the question blank, or say no negative interaction occurred; see pp. 14–15 for additional detail); including this criterion eliminated many instances in which the participant did not actually report a true negative interaction that elicited negative emotion. This resulted in $n = 1,335$ observations excluded. Subsequently, observations in which the participant responded with answers indicating "nothing happened" or with nonsensical answers were dropped ($n = 158$ observations). Finally, participants who responded to fewer than three calls that met the above criteria were dropped ($n = 1$ participant), resulting in a final analysis sample of 3,521 observations nested in 114 participants.

Due to the nested nature of the data, with observations nested within persons, multilevel analyses were conducted in R (R Core Team, 2019) using the lme4 package (Bates et al., 2015). As the outcome was a dichotomous switch propensity, generalized multilevel models with a logistic link function were used. An example equation for switching propensity analyses is presented below (Houben et al., 2016). Please note, below we present the equation for overall strategy switching, including change in intensity of affect from the previous timepoint as a sample time-varying predictor. Similar equations were used for each of the four categories of switching (primary, secondary, disengagement, involuntary). Final models included all significant covariates and tested all predictors simultaneously.

Final model for overall strategy switching

Level-1 model:

$$\text{Prob}(\text{Switch}_{ij} = 1 | \beta_j) = \phi_{ij}$$

$$\log[\phi_{ij}/(1 - \phi_{ij})] = \eta_{ij}$$

$$\eta_{ij} = \beta_{0j} + \beta_1 \text{Intensity} \Delta_{ij}$$

Level-2 model:

$$\beta_{0j} = \gamma_{00} + \gamma_{01} \text{Age}_j + \gamma_{02} \text{Race}_j + u_{0j}$$

The random intercept in these models reflects the mean log-odds of switching for a given adolescent, as a function of between-person predictors at level-2. Log-odds were converted

to odds ratios (*OR*) for ease of interpretation, such that $OR > 1$ indicate greater propensity to switch (overall or to a given strategy type), whereas $OR < 1$ indicate less propensity to switch. A model building approach was employed, starting with means-only models to estimate intraclass correlation coefficients (ICCs). Second, covariates were tested, with only significant covariates retained. Finally, predictors were tested, first independently and then in conjunction. (Results reported are from models testing all predictors in conjunction.) To capture effects at the within-person level, change scores for emotional intensity and perceived control were calculated, using lagged data from the previous timepoint (i.e., the same two timepoints used to calculate strategy switches).⁴

Results

Descriptive analyses

The average age of the 114 participants in the analysis sample was 12.26 ($SD = 0.80$). Seventy-seven girls identified as white (67.5%), whereas 37 (32.5%) reported identifying as another race or as bi- or multiracial. Participants reported family income levels ranging from \$0–10,000 to \$100,000+, with a sample average of \$70,001–80,000.

Comparative frequencies of use of each strategy are depicted in Figure 1. Acceptance was the most frequently reported strategy, consistent with prior reports in adolescence (Lennarz et al., 2019; Tan et al., 2012). However, it is worth noting that adolescents most frequently reported that they did not use any of the specific strategies provided. A sampling of participants' strategy use time series is depicted in Figure 2. Participants appear to differ in (a) the overall number of strategies used and (b) the number of switches between strategies.

Model building

First, a series of unconditional random intercept models were used to explore between- and within-person variability for each outcome through the ICC. ICCs ranged from .07–.38. All outcomes contained some between-person variability, although there was relatively little for several variables. A 3-level model of observations nested in study day nested within participants indicated a significant random effect of study day in the model of overall strategy switching only. Including a fixed effect of study time in the model indicated that participants reported fewer switches as they progressed through the study. As study time did not contribute significant random variance in any of the other four models, a fixed effect of time was included in a 2-level model of observations nested within participants for all switch outcomes. All predictors were *z*-scored to avoid convergence issues related to differences in scale, with the exception of in-the-moment co-regulatory support, which was coded 0/1.

Bivariate associations

Correlations were run in Mplus Version 8.4 (Muthén & Muthén, 1998–2020) to account for the multilevel structure of the data and allow for decomposition of within- versus between-person associations. As a note, the below correlations reflect associations with raw use of each strategy type, as compared to switches. Bivariate

correlations, significance, and 95% credibility intervals are presented in Table 1.

Between-person correlations

Between-person involuntary engagement was moderately positively associated with secondary control, such that people who tended to use involuntary engagement strategies also tended to report using secondary control strategies. Between-person disengagement strategy use was moderately negatively associated with secondary control strategy use. Dispositional shyness was also negatively associated with disengagement strategy use at a moderate effect size. Between-person perceived control was moderately negatively associated with secondary control strategy use, such that girls who tended to feel they had more control over negative interpersonal situations were less likely to engage in secondary control strategies. Between-person perceived control was also modestly negatively associated with involuntary engagement, such that girls who tended to feel they had more control over negative interpersonal situations were less likely to engage in involuntary control strategies. There was also a small to moderate positive between-person association between perceived control and emotional intensity, such that girls who felt they had more control over situations tended to report higher intensity emotions. In addition, perceived controllability was moderately positively associated with co-regulatory support, indicating that girls who perceived negative events as more controllable on average reported having co-regulatory support on a greater percentage of occasions. Co-regulatory support was also moderately positively associated with primary control strategy use, with girls who reported more co-regulatory support on average also reporting more use of primary control strategies on average. Finally, between-person emotional intensity was positively associated with use of involuntary engagement at a moderate to strong effect size, such that girls who experienced higher levels of emotional intensity on average reported more use of involuntary engagement on average.

Within-person correlations

At the within-person level, primary control strategy use exhibited positive correlations at small effect sizes with perceived control and emotional intensity, and a positive association with co-regulatory support at a medium effect size, such that girls were more likely to use a primary control strategy when they felt they had more control over the situation, when they reported higher levels of emotion, and when they received co-regulatory support in the moment. Secondary control strategy use exhibited negative correlations at small effect sizes with perceived control and emotional intensity, and a negative correlation with co-regulatory support at a medium effect size. These associations indicate that girls were less likely to report using a secondary control strategy in moments when they perceived relatively more control over a situation, experienced greater emotional intensity, or received co-regulatory support. Involuntary engagement strategy use was positively associated with emotional intensity and co-regulatory support, and negatively associated with perceived control, ranging from very small to medium effect sizes; in other words, girls were more likely to report ruminating in moments when they perceived higher levels of emotional intensity, greater co-regulatory support, and lower control over a situation. Emotional intensity and perceived control were inversely correlated at a small effect size, indicating that in moments when girls experienced higher levels of emotion, they perceived less control over the situation. Finally, co-regulatory support was positively correlated with perceived controllability and

⁴There are many models that could be of theoretical interest for such a study design. For example, it is possible that one could wonder whether strategy switching during school hours is different from other times of the day. Though empirically interesting, such questions diverge from the current study's primary goal and would benefit from data collection specifically targeted for such a research question.

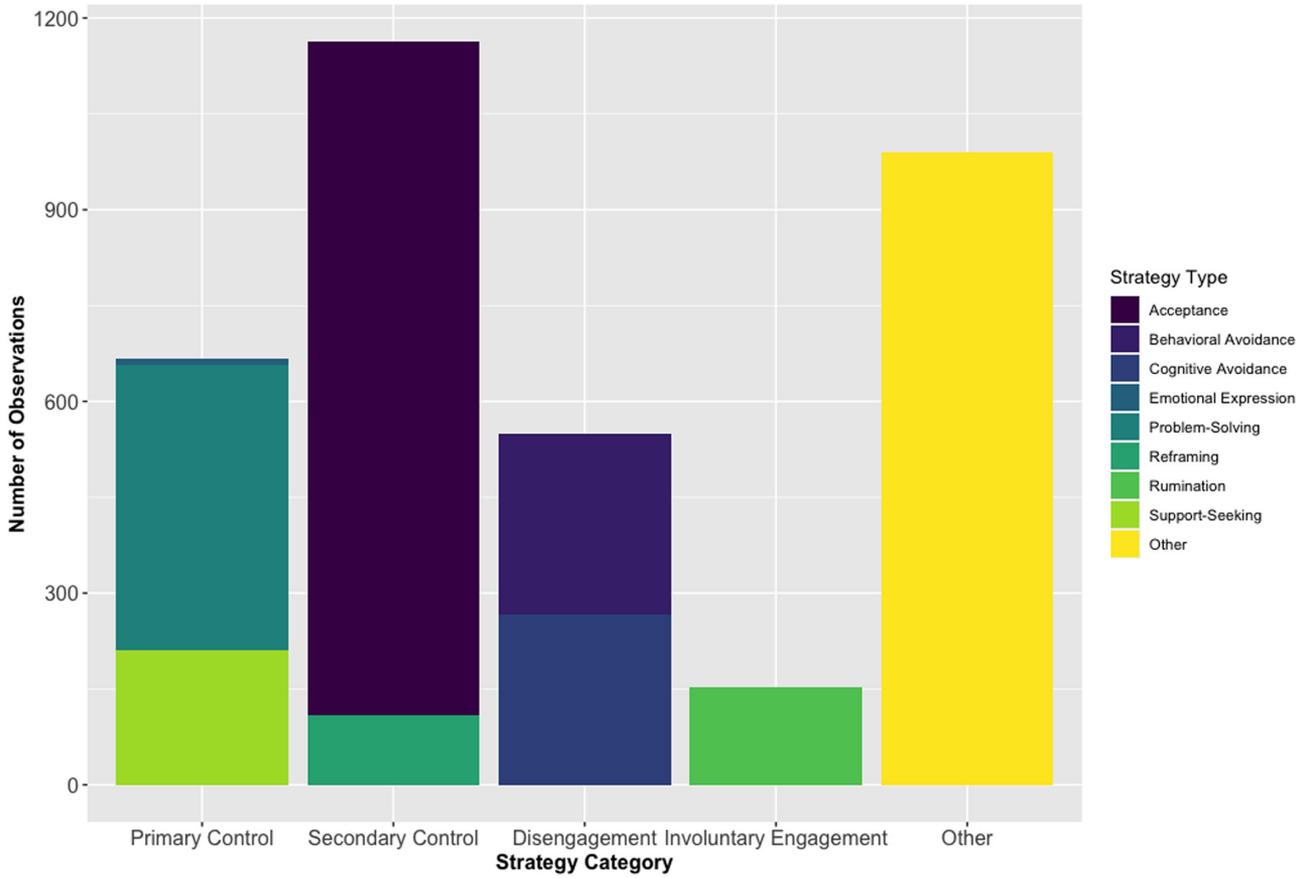


Figure 1. Frequency of use of strategies by type.

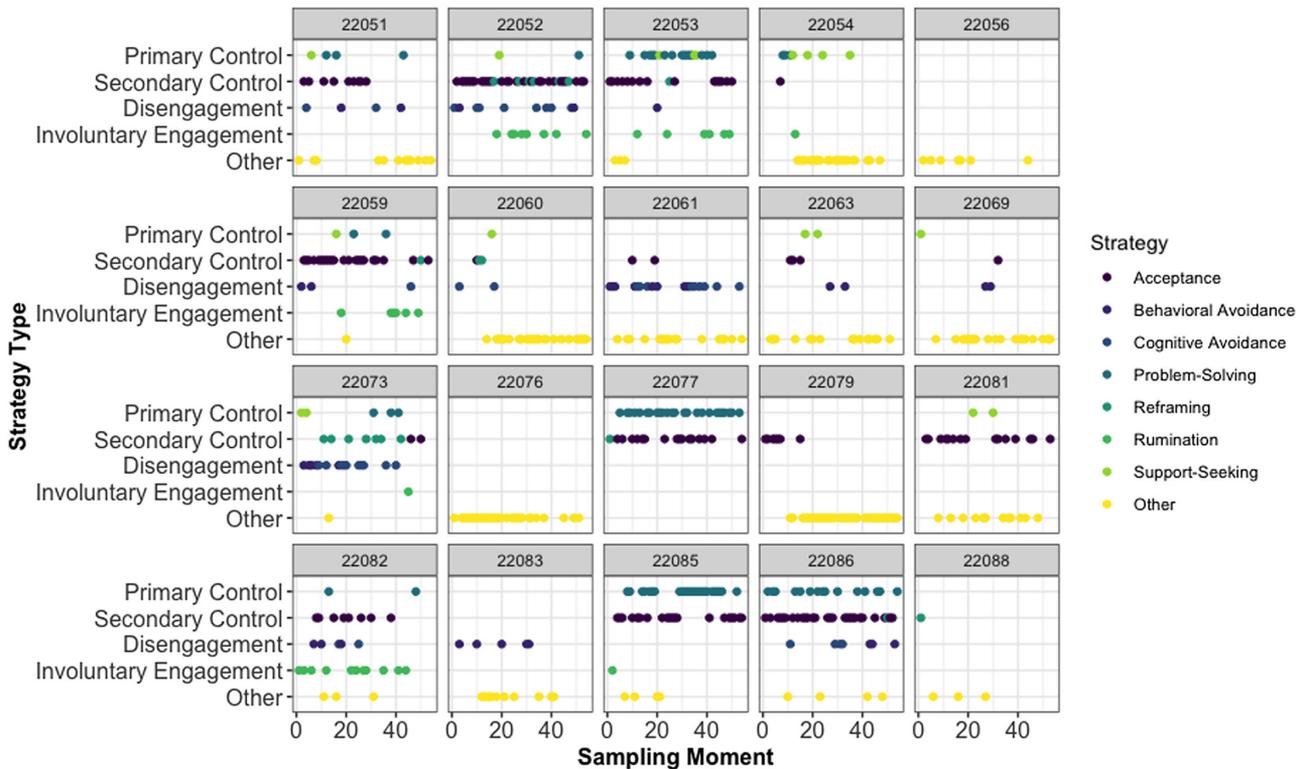


Figure 2. Fluctuations in strategy use over time for a selection of participants.

Table 1. Descriptive statistics and bivariate correlations of variables

| Variable | <i>M (SD)/%</i> | Perceived controllability | Emotional intensity | Co-regulatory support | | | | | | | |
|------------------------------|-----------------|------------------------------|------------------------|--------------------------|-------------------|-----------------------|------------------|------------------|------------------|------------------|----|
| <i>Within-person</i> | | | | | | | | | | | |
| Primary control | 18.86% | .12 [.10, .17] | .04 [.01, .08] | .22 [.19, .25] | | | | | | | |
| Secondary control | 32.91% | -.12 [-.15, -.08] | -.06 [-.09, -.03] | -.12 [-.15, -.09] | | | | | | | |
| Involuntary engagement | 4.33% | -.07 [-.10, -.03] | .09 [.05, .12] | .04 [.00, .06] | | | | | | | |
| Disengagement | 15.57% | .01 [-.03, .04] | .02 [-.01, .05] | -.01 [-.04, .02] | | | | | | | |
| Perceived controllability | 0 (2.29) | - | -.06 [-.09, -.03] | .05 [.01, .08] | | | | | | | |
| Emotional intensity | 0 (1.92) | - | - | .10 [.06, .14] | | | | | | | |
| Co-regulatory support | 67.93% | | | - | | | | | | | |
| <i>Between-person</i> | | | | | | | | | | | |
| Variable | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| 1. Primary control | .18 (.19) | - | | | | | | | | | |
| 2. Secondary control | .30 (.24) | .08 [-.14, .31] | - | | | | | | | | |
| 3. Involuntary engagement | .04 (.08) | -.06 [-.31, .14] | .21 [.03, .40] | - | | | | | | | |
| 4. Disengagement | .14 (.17) | -.12 [-.33, .08] | -.22 [-.42, -.01] | -.09 [-.37, .16] | - | | | | | | |
| 5. Perceived controllability | 35.79 (21.43) | .06 [-.12, .29] | -.32 [-.53, -.09] | -.19 [-.45, -.02] | .07 [-.18, .32] | - | | | | | |
| 6. Co-regulatory support | .34 (.26) | .37 [.16, .55] | -.05 [-.23, .14] | .14 [-.18, .44] | .12 [-.08, .32] | .23 [.01, .40] | - | | | | |
| 7. Emotional intensity | 53.59 (19.65) | .03 [-.20, .28] | -.04 [-.27, .18] | .29 [.07, .52] | .01 [-.17, .23] | .29 [.04, .46] | .13 [-.07, .33] | - | | | |
| 8. Shyness | 2.75 (0.96) | .03 [-.15, .27] | .13 [-.06, .33] | .02 [-.19, .25] | -.34 [-.49, -.11] | .02 [-.18, .23] | -.08 [-.27, .19] | -.01 [-.24, .16] | - | | |
| 9. Age | 12.26 (0.8) | .14 [-.08, .39] | .11 [-.08, .29] | .15 [-.15, .31] | .13 [-.08, .35] | .03 [-.14, .22] | .06 [-.14, .30] | .03 [-.21, .17] | -.11 [-.32, .09] | - | |
| 10. Non-White | 37% | -.14 [-.33, .03] | -.17 [-.39, .01] | .05 [-.15, .31] | -.03 [-.24, .17] | .19 [-.02, .35] | .15 [-.08, .37] | .08 [-.12, .32] | .03 [-.20, .23] | -.20 [-.40, .02] | - |

Note. $N = 114$ (3,521 observations). Values in brackets are the 95% credibility intervals and values in bold are those for which the credibility interval does not contain zero. Within-person (person-mean centered) continuous variables by design have $M = 0$. For binary variables, between-person percentages indicate the average number of observations in which participants endorsed that variable (i.e., the grand mean). Within-person binary variables display the percentage of total observations in which that variable was endorsed.

emotional intensity at small effect sizes, indicating girls perceived events were more controllable and more emotionally intense in moments they received co-regulatory support.

Covariates

Covariates were tested individually per outcome, with the exception of puberty, which was tested alongside age, and only covariates that remained significant were retained. Age significantly predicted propensity to switch to secondary control and involuntary engagement strategies, such that older adolescents were more likely to report switching to these categories than younger adolescents. Race was a significant predictor of strategy switching, such that, on average, non-White adolescents were less likely to switch strategies overall, and less likely to switch to secondary control strategies. Puberty significantly predicted switches to secondary control strategies, such that, holding age constant, girls with more advanced pubertal status were less likely to switch to secondary control strategies.⁵

Switching analyses

Results from switching analyses are included in Table 2.

Individual differences in overall switch variability

There was a significant random effect of person in the overall switch variability model, indicating that individuals differed in the extent to which they switched strategies (hypothesis 1.2). Notably, the fixed intercept indicated that *on average* across observations and people, participants were not more likely to switch strategies than persist in the same strategy over time (hypothesis 1.1).

Between-person associations

Age and race remained significant covariates in multivariate models. Non-White adolescents reported lower switch propensity overall and to secondary control strategies, compared to White adolescents. Contrary to hypotheses, neither age (hypothesis 2.1) nor emotional intensity (hypothesis 2.2) was associated with greater overall switch variability, indicating that older adolescents were not more likely to switch strategies, on average, compared to younger adolescents, and adolescents were not more likely to switch strategies if they had higher levels of perceived emotional intensity on average. However, greater chronological age was significantly associated with greater switch propensity to secondary control strategies and involuntary engagement, such that for every 1 *SD* increase in age, adolescent girls were 22% more likely to switch to a secondary control strategy (e.g., acceptance, reframing) and 50% more likely to switch to rumination. Higher dispositional

⁵As adolescents who use a wider variety of strategies overall may switch strategies more often, we calculated the total number of distinct strategies used by an adolescent across the entire 16-day EMA protocol as a measure of *strategy repertoire*. Repertoire significantly predicted overall strategy switching ($OR = 1.48, p < .001$), indicating that participants were more likely to report switching strategies if they reported using a wider variety of strategies across the assessment period. This finding was supported by significant effects of repertoire on each of the switching categories: primary control ($OR = 1.19, p < .001$), secondary control ($OR = 1.19, p < .001$), involuntary engagement ($OR = 2.01, p < .001$), and disengagement ($OR = 1.44, p < .001$). Although associated with strategy switching, repertoire is not equivalent; one can imagine a participant who uses a lot of strategies throughout the 16-day EMA period, but switches relatively infrequently, by using one strategy multiple times in a row, before switching to another strategy multiple times in a row. The number of strategies could ultimately be large but the number of switches relatively minimal. Repertoire was not included in models as a covariate, as it would likely result in a model that would over-adjust for the variance of interest.

shyness was associated with lower likelihood to switch to a disengagement strategy.

Although between-person emotional intensity was not associated with overall switch variability (hypothesis 2.2), it was significantly associated with greater propensity to switch to involuntary engagement, such that girls with average levels of emotional intensity 1 *SD* greater than the sample average (or 73.3 vs. 53.6 on the 100-point scale) had more than twice the likelihood of switching to involuntary engagement. Greater between-person perceived control was associated with lower propensity to switch to secondary control strategies and involuntary engagement. In other words, individuals who tended to report they had more control of situations on average were less likely to report switching to secondary control and involuntary engagement strategies.

Within-person change

Increases in perceived control from the previous timepoint were associated with greater propensity to switch to a primary control strategy (hypothesis 3.1.1) and lower propensity to switch to a secondary control strategy (hypothesis 3.1.2). In other words, for every 1 *SD* increase in perceived control from the previous timepoint, participants were 46% more likely to switch to a primary control strategy and 24% less likely to switch to a secondary control strategy. Increases in emotional intensity from the previous timepoint were significantly associated with lower propensity to switch to a secondary control strategy and greater propensity to switch to involuntary engagement and disengagement strategies, such that for every 1 *SD* increase in emotional intensity from the previous timepoint, girls were 13% less likely to switch to a secondary control strategy and 19% and 29% more likely to switch to a disengagement strategy (hypothesis 3.2.1) or involuntary engagement (hypothesis 3.2.2), respectively. In-the-moment co-regulation was associated with increased propensity to switch strategies overall (overall strategy switching), indicating that when participants co-regulated in the moment (vs. not co-regulating) they were 26% more likely to switch strategies overall. Although in-the-moment co-regulation was associated with greater likelihood of switching to a primary control strategy (hypothesis 3.3), when switches to support seeking were removed from the primary control category, the association was no longer significant ($OR = 1.28[0.94-1.73]; p = 0.112$). In-the-moment co-regulation was also associated with lower propensity to switch to a secondary control strategy, such that in moments when participants engaged in co-regulation, they were 42% less likely to switch to a secondary control strategy.

Discussion

This study leveraged an analytic approach used in the emotion dynamics literature, emotion regulation strategy switching, to operationalize and assess real-life emotion regulation flexibility. Results revealed critical proof-of-concept findings supporting strategy switching as a fruitful approach to operationalizing alterations in emotion regulation strategy deployment in adolescent girls. Broadly, girls differed in the degree to which they switched strategies. Although research on emotion regulation repertoires indicates that some adolescents deploy a wider variety of emotion regulation strategies in their daily lives than others (Lennarz *et al.*, 2019; Loughheed & Hollenstein, 2012), this study provides empirical support for this notion dynamically, demonstrating that adolescent girls use varying strategies in their daily lives and alter the selection of these strategies based on several key contextual factors. At the

Table 2. Odds ratios, confidence intervals, and significance levels for strategy switches, overall and by category

| Predictors | Gross switch variability | | | Primary control switch | | | Secondary control switch | | | Involuntary switch | | | Disengagement switch | | |
|---|--------------------------|-----------------------|-----------------|------------------------|-----------------------|-----------------|--------------------------|-----------------------|-----------------|------------------------|-----------------------|-----------------|------------------------|-----------------------|-----------------|
| | Odds ratios | CI | <i>p</i> | Odds ratios | CI | <i>p</i> | Odds ratios | CI | <i>p</i> | Odds ratios | CI | <i>p</i> | Odds ratios | CI | <i>p</i> |
| Intercept | 1.14 | 0.91–1.43 | .254 | 0.06 | 0.05–0.08 | <.001 | 0.20 | 0.17–0.24 | <.001 | 0.01 | 0.01–0.02 | <.001 | 0.07 | 0.05–0.09 | <.001 |
| Time | 0.73 | 0.67–0.79 | <.001 | 0.97 | 0.87–1.09 | .649 | 0.86 | 0.78–0.95 | .002 | 0.95 | 0.78–1.17 | .646 | 0.81 | 0.71–0.92 | .001 |
| Non-White | 0.63 | 0.42–0.95 | .027 | | | | 0.69 | 0.50–0.95 | .022 | | | | | | |
| Age | | | | | | | 1.24 | 1.05–1.45 | .009 | 1.50 | 1.08–2.08 | .016 | | | |
| Puberty | | | | | | | 0.91 | 0.77–1.06 | .214 | | | | | | |
| Shyness | | | | | | | | | | | | | 0.77 | 0.61–0.96 | .023 |
| BP emotional intensity | 1.13 | 0.94–1.37 | .189 | 0.94 | 0.78–1.14 | .546 | 1.06 | 0.92–1.21 | .430 | 2.02 | 1.44–2.84 | <.001 | 1.01 | 0.81–1.27 | .902 |
| Change emotional intensity | 1.01 | 0.94–1.09 | .798 | 1.01 | 0.90–1.13 | .857 | 0.88 | 0.79–0.97 | .008 | 1.29 | 1.07–1.55 | .007 | 1.18 | 1.04–1.34 | .010 |
| BP perceived control | 0.84 | 0.70–1.02 | .072 | 0.93 | 0.77–1.13 | .489 | 0.82 | 0.71–0.95 | .007 | 0.64 | 0.46–0.90 | .010 | 0.91 | 0.72–1.15 | .427 |
| Change perceived control | 1.04 | 0.96–1.12 | .348 | 1.45 | 1.29–1.62 | <.001 | 0.76 | 0.69–0.84 | <.001 | 0.82 | 0.68–1.01 | .059 | 1.04 | 0.92–1.17 | .556 |
| In-the-moment co-regulatory support | 1.24 | 1.03–1.50 | .023 | 2.85 | 2.21–3.69 | <.001 | 0.58 | 0.45–0.74 | <.001 | 1.37 | 0.86–2.19 | .187 | 0.85 | 0.63–1.16 | .308 |
| BP co-regulatory support | 1.09 | 0.91–1.32 | .354 | 0.98 | 0.80–1.19 | .829 | 1.14 | 0.98–1.33 | .084 | 1.09 | 0.78–1.52 | .615 | 0.93 | 0.73–1.19 | .575 |
| σ^2 | 3.29 | | | 3.29 | | | 3.29 | | | 3.29 | | | 3.29 | | |
| τ_{00} | 0.77 _{ID_Num} | | | 0.52 _{ID_Num} | | | 0.17 _{ID_Num} | | | 1.10 _{ID_Num} | | | 0.75 _{ID_Num} | | |
| ICC | 0.19 | | | 0.14 | | | 0.05 | | | 0.25 | | | 0.18 | | |
| <i>N</i> | | 114 _{ID_Num} | | | 114 _{ID_Num} | | | 112 _{ID_Num} | | | 114 _{ID_Num} | | | 113 _{ID_Num} | |
| Observations | | 3379 | | | 3388 | | | 3357 | | | 3388 | | | 3342 | |
| Marginal R ² /conditional R ² | | 0.047/0.227 | | | 0.089/0.214 | | | 0.080/0.124 | | | 0.163/0.373 | | | 0.038/0.216 | |

Values in bold are those for which $p < .05$.

highest level, the primary findings of the current report are consistent with global findings on coping and response styles theories of coping (Band & Weisz, 1988; Compas et al., 2001), extending these findings to dynamic, real-world settings, as discussed below.

First, adolescent girls altered their emotion regulation strategy selection based on the level of control they perceived over the interpersonal stressors they experienced, both on average and from timepoint to timepoint. Adolescent girls who perceived more control over the negative interpersonal events in their lives, on average, were less likely to switch to secondary control strategies (e.g., cognitive reframing, acceptance) and to rumination. This may reflect that, under personal circumstances where the majority of interpersonal stressors are (more) controllable, adolescents are able to problem-solve and seek interpersonal support to alleviate most sources of stress and are, therefore, less likely to be required to switch to strategies that are focused on coping with negative emotion, compared to adolescents who experience a higher degree of uncontrollable interpersonal stressors (e.g., harsh parenting). Alternately, it could be that those adolescents who rely primarily on strategies focused on coping with negative emotion (and therefore are not successful in directly addressing stressors) perceive that they have less control over distressing situations. At the within-person level, by comparison, when adolescents perceived greater control over a negative interpersonal interaction in the

moment, compared to how much control they perceived at the previous timepoint, they were more likely to alter their regulatory strategy in favor of selecting primary control strategies like problem solving and seeking social support, and less likely to attempt to cognitively reframe the situation or accept it (i.e., switch to a secondary strategy). These findings provide clear, dynamic support of the Band and Weisz (1988) and subsequent Compas et al. (2001) models of problem- and emotion-focused models of emotional coping, in which more controllable situations are theorized to be best managed via proactive, problem-focused strategies, whereas situations outside of individuals' control are thought to be best tackled via emotion-focused strategies such as reframing or acceptance. Of note, although the findings broadly support these theoretical models, we did not assess the effectiveness of strategy switches and therefore cannot extend the findings to the effectiveness of a particular switch, but rather that switches to particular categories occurred in concert with particular changes in the context.

Second, the extent to which adolescent girls perceived a negative interpersonal event as evoking negative emotion was associated with adolescents switching strategies, both on average and as the negative affect intensity changed from timepoint to timepoint. Experiencing negative interpersonal events as more evocative of negative emotion on average (i.e., higher average emotional

intensity) was associated with more switching to rumination, to the extent that girls who perceived events as 1 *SD* more emotionally intense on average were more than twice as likely to switch to rumination as a regulatory response on average. Similarly, when an interpersonal interaction was rated as eliciting more intense negative affect in the moment, compared to the previous interpersonal event, girls were more likely to report ruminating and engaging in avoidance-based disengagement strategies. In such moments they were less likely to switch to secondary control strategies of reframing or accepting the situation. Once again, these findings provide dynamic support of emotional coping models (Compas et al., 2001) that indicate that higher levels of emotional intensity are associated with more use of involuntary engagement strategies like rumination and avoidance-based coping, although it is worth noting that the effects of change in emotional intensity on disengagement and secondary control strategy switching were quite small and as such should be replicated in other samples. Clearly, many adolescent girls are altering their regulatory approach in response to alterations in the environment – either real or perceived – providing support to strategy switching as a method for operationalizing regulatory flexibility and revealing correlates of what leads to changes in regulation in the moment.

Turning to the findings on strategy switching in the context of co-regulation, engaging in co-regulation in the moment was associated with lower likelihood of switching to cognitive reframing or acceptance (secondary control). Further, co-regulating in the moment was associated with greater likelihood of switching strategies overall, albeit not to any specific category. There are several possible interpretations of these effects. First, it may be that engaging with another person in their regulatory efforts in the moment is serving to “push” adolescents away from more internal, emotion-focused strategies like reframing or acceptance and toward more proactive strategies like problem solving, such as via overt encouragement to tackle problems head-on, or providing novel insight or options for regulatory approaches (i.e., expanding one’s repertoire of strategies). Alternately, adolescents may be engaging in co-regulatory processes such as co-rumination with their peers in the moment, assuming their support-providing peers are more inclined to frequently engage in such strategies (Schwartz-Mette & Rose, 2012). Broadly, these findings appear to be consistent with the complex findings emerging from research on co-regulation, which indicates that the effects of co-regulation differ dependent on the precise strategy that individuals are engaging in (Stone et al., 2011; Waller et al., 2014).

Finally, strategy switching was associated with chronological age: Older adolescents, although not likely to switch strategies overall, were more likely to switch to secondary control strategies and rumination. These findings are consistent with the rather complex developmental findings on emotion regulation strategy use in adolescence, which indicate that, whereas older adolescents are more likely to have the cognitive control to implement more cognitively demanding strategies like cognitive reframing (Schweizer et al., 2020; Silvers et al., 2012), they are also more likely to deploy maladaptive strategies like rumination (Compas et al., 2017). The increased likelihood of switching to secondary control strategies may reflect similar age-related increases in underlying processes like affective control, which may enable the deployment of those strategies more frequently (i.e., due to increased repertoire or a broader array of available reframes) or more successfully. The rumination findings may reflect a parallel argument: As older adolescents switch to cognitive strategies more frequently, they may find themselves “stuck” more often in ruminative cycles rather

than reframing or practicing acceptance effectively. Conversely, the rumination findings may be reflective of onsetting depressive symptoms or prodromal depression in older adolescents, considering rumination is a frequent characteristic of depression and depression increases significantly in adolescent girls (Hankin et al., 2015). Longitudinal studies, such as cross-lagged panel studies examining concurrent strategy switching and symptoms of psychopathology, are needed to shed light on these potential explanations. Finally, the sample included here was relatively restricted in terms of developmental stage (i.e., early adolescence). Future research should examine switching behavior across a broader developmental window and in longitudinal frameworks to assess whether flexibility changes across development (Hollenstein et al., 2013).

The distinction in these findings emphasizes the importance of decomposing broad associations into constituent between- and within-person associations, as doing so can shed additional light on underlying processes. The findings presented here indicate that many of these associations are dynamic, within-person processes: The choice to alter one’s emotion regulation strategy appears to be more robustly associated with how adolescent girls perceive events differ in their intensity and controllability over time, versus dispositional or aggregate differences between individuals in average levels of perceived intensity/controllability. Indeed, while you would expect something like higher levels of perceived control on average to be associated with more switching to primary control strategies, the results presented here do not bear that out. One notable exception is rumination, which appears to be more strongly associated with between-person factors, as chronological age as well as average levels of both emotional intensity and perceived controllability are associated with likelihood of switching to rumination, albeit in opposite directions (intensity positively and controllability negatively). To summarize, rather than reflecting associations in emotion regulation strategy selection with the context based on individual differences, these findings emphasize the importance of changes in contextual factors (albeit translated through individual perceptions/self-report). This overarching finding points to the relevance of context-sensitivity models (Bonanno & Burton, 2013), which assert that the primary individual difference measure as it relates to flexibility and well-being is the ability to detect changes in the environment, thereby enabling flexible adaptation to those changes.

Although the findings presented here provide an important extension to self-report findings on models of coping and emotion regulation, this study captures *correlates* of within- and between-person strategy switching, and the results are therefore unable to inform the causality or directional nature of these associations, or the effectiveness of strategy switches, as noted above. As referenced above, there are plausible interpretations of these findings in which characteristics of the context or changes in context are driving adolescent girls to alter their regulatory approach from timepoint to timepoint or leading to individual differences in strategy deployment on average. Simultaneously, it may be that individual differences in *perceptions* of the context (i.e., controllability, intensity) are the driving force behind the strategy switching observed here, and those individual differences may be operating at the between- or within-person level. Though cross-level interactions were not included in the present work, future research should include these effects to explore the dynamics of strategy deployment. Further, research is needed to examine the directional nature of these associations and to explore causal associations, perhaps through experimental studies of naturalistic emotionally evocative

situations in which controllability and intensity are manipulated. For example, one could design a paradigm in which adolescents encounter a series of situations pre-coded for controllability/intensity, to examine how strategy selection changes and if it interacts with individual differences in *perceptions* of controllability/intensity. Finally, it is possible that correlates of switches are themselves dependent on the negative emotion-eliciting context. The current study primarily examined negative social interactions with peers. Given the robust literature on the impact of negative peer interaction on emotions, this is a reasonable approach. Other interactions (e.g., parent interactions or nonsocial environments) may have important, yet different, roles in emotion regulation strategy use. Additional studies that capture a wider range of contexts are needed to test this question.

Importantly, the analyses conducted here are not able to speak to the relative *effectiveness* of switching strategies in accordance with these perceived changes in context. Although theoretical conceptualizations of flexibility often conflate flexibility with adaptiveness or positive outcomes, recently scholars have highlighted the necessity to disentangle flexibility (e.g., as individual change in response to contextual change) with adaptiveness (e.g., improvements in symptoms or pathological processes; Aldao et al., 2015; Hollenstein, 2015). Indeed, the switches observed here, despite being well-aligned with self-report findings on coping, may not be associated with higher levels of effectiveness or more adaptive functioning, and, indeed, many switches are to rumination, which is well-substantiated as an ineffective and often actively harmful strategy regardless of the context (Nolen-Hoeksema et al., 2008). Additionally, some adolescents – for example, those displaying limited regulatory repertoires (see Figure 2) – may be switching strategies despite ineffectiveness of the strategy for the context. The strategy switching method used here could be leveraged in future studies to move beyond global differences in effectiveness of various strategies, and instead compare the effectiveness of strategies when an individual switches or does not, a novel conceptualization of strategy-situation fit (Aldao et al., 2015). Such studies would additionally benefit from the direct comparison of repertoire-based measures and strategy switching; although we examined associations between adolescents' emotion regulation repertoires (i.e., see footnote on p. 26) and strategy switching, we did not directly engage with the theoretical overlap of these measures or attempt to precisely determine how strategy switching and repertoires are related or distinct. Future research incorporating assessments of the effectiveness of strategies and adolescents' goals in the context of their regulatory efforts is needed to further examine the utility of strategy switching as an operationalization of emotion regulation flexibility. Additionally, there is a temptation to view emotion regulation strategy selection as a deliberate or effortful process, and indeed many switches may reflect proactive effort or increased regulatory capacity. However, some of the switches observed may be reflexive or otherwise automatic, which may have implications for the effectiveness or adaptability of such strategies. Even switches to broadly “adaptive” strategies like problem solving may be maladaptive when deployed reflexively in circumstances that are poorly suited to problem-focused strategies (e.g., switching to problem solving to address a teacher who is harsh or grades unfairly). Indeed, it is likely the case that for some adolescents *persisting* in a strategy will be critical to the eventual effectiveness of that strategy, and one study has demonstrated that persisting in largely adaptive strategies despite initial negative feedback is broadly associated with mental health (Southward et al., 2018). Additional research examining the level of effortfulness

involved in strategy switching, in addition to research on persistence, effectiveness, and adaptability, will be necessary to further understand the circumstances in which strategy switching is beneficial or related to pathological processes.

Implications for developmental psychopathology

The results presented here suggest that real-world emotion regulation strategy switching may be a fruitful target for intervention in adolescence: Adolescents who switch between fewer strategies are likely more rigid and inflexible in their emotion regulation, which may reflect underlying risk for psychopathology. Alternately, adolescents who develop more limited abilities to alter their regulatory approach in early adolescence may ultimately be at greater risk for psychopathology in later adolescence and early adulthood, as they would be less likely to be as successful in adapting to the increasingly varied and complex challenges faced as they progress through life. Interventions that target expanding adolescents' emotion regulation repertoires and aid them in monitoring changes in the context that might require switching their regulatory approach – or staying the course with their current strategy, if the environment demands it, may be particularly beneficial. It is important to note, however, that the sample included here was recruited based on enriched risk for internalizing psychopathology based on temperamental shyness and fearfulness, and we are therefore unable to speak to any potential clinical alterations in switching, such as how clinically significant symptoms of depression or anxiety might be associated with individuals' emotion regulation strategy switching. Theoretically, various clinical populations may differ from healthy populations in the degree to which they are able to switch strategies (e.g., avoidant strategies in clinical anxiety samples; less switching in depression, Rottenberg & Hindash, 2015). Future research on strategy switching as it relates to symptoms of psychopathology is needed to ascertain whether the alterations in regulatory strategy use observed here are associated with symptoms or impairment. Research in a longitudinal framework will be particularly important: Although one can theorize that dispositional differences or changes in emotion regulation flexibility may precede the onset of psychopathology, it is also possible that the development of clinically significant symptoms may result in an alteration in strategy switching. One study on the directional nature of emotion regulation strategy use supports the notion that depressive symptoms may precede changes in strategy use (De France et al., 2019); however, as this study examined a single strategy (suppression), the relevance of its findings to the dynamic and multi-strategy process of strategy switching may be limited.

Limitations

Several limitations are worth mentioning. Although the analyses here capture contextual factors that drive adolescent girls to switch to a particular type of emotion regulation strategy, we were unable to simultaneously capture what type of strategy they were switching *from* without engaging in excessive multiple testing. Future research examining how contextual factors lead adolescents to move *away from* certain emotion regulation strategies is needed. Similarly, the time-based EMA methods employed here may be masking some meaningful switching variability. We assessed only the single event that elicited the most negative affect occurring since the previous timepoint, it may be that some individuals experienced more NA-eliciting events and engaged in additional regulatory efforts than others, and we missed some variability in strategy switching as a result (e.g., Hollenstein, 2021). Future

studies leveraging event-contingent EMA designs or assessing at more intensive schedules (i.e., more assessments per day) would generate important additional insight into the within- and between-person processes identified here.

A second limitation is the high frequency with which participants endorsed the option “I did not do any of these things.” It is possible we did not assess certain strategies that participants were using (e.g., soothing via listening to music), or that participants were not engaging in regulatory efforts at all. It is also worth noting that adolescents were required to select a single strategy from the list; however, it is possible that adolescents deploy multiple strategies simultaneously, and participants were not instructed explicitly on how to select a single strategy in the event they used multiple emotion regulation strategies in response to the same negative event. As a result, some participants may have reported the first strategy they employed, whereas others may have reported the most effective or salient strategy. Previous studies of adolescent emotion regulation in EMA applications indicate that adolescents often endorse only one strategy (Lennarz et al., 2019), even when they have the option of selecting multiple, which implies that adolescents routinely experience using one strategy during eliciting events (although they may be unaware of other strategies used and abandoned). Finally, as this study exclusively studies predominantly White girls in early adolescence, its generalizability is limited, and studies are needed that examine similar processes in adolescent boys and transgender youth, adolescents from different racial and ethnic backgrounds, and across a wider range of ages in adolescence.

Conclusions

This study employed a novel statistical method – emotion regulation strategy switching – to examine how adolescents switch between different emotion regulation strategies throughout their daily lives. We identified a number of different contextual factors, grounded in the coping and emotion regulation literatures, that are associated with strategy switching, namely perceived controllability, emotional intensity, and co-regulatory support. Results indicate that adolescent girls dynamically shift their emotion regulation strategy approach in concordance with changes in their environments, and that some adolescents do so more than others. These findings suggest that strategy switching may be a promising approach for operationalizing and intervening in emotion regulation flexibility, which has long been a focus of transdiagnostic interest in developmental psychopathology and clinical psychological science more broadly.

Funding statement. Research reported in this publication was supported by National Institute of Mental Health of the National Institutes of Health under award number R01MH103241 to Jennifer S. Silk and Cecile D. Ladouceur. Content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health.

Conflicts of interest. None.

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