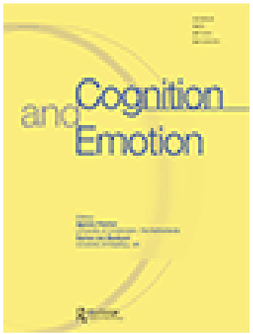

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BRIEF ARTICLE

The fit between emotion regulation choice and individual resources is associated with adaptive functioning among young children

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ABSTRACT

Being able to resist temptation at a young age is crucial for successful functioning yet it can be challenging. According to the Selection, Optimization, and Compensation with Emotion Regulation (SOC-ER) framework, one central element of successful functioning is *selection* which involves choosing among regulatory options whose resource requirements fits with the amount of available resources an individual possesses. Although conceptually important, direct empirical evidence is lacking. Accordingly, the present study utilised performance based measures to examine the interactive effect of regulatory selection to resist temptation, and individual differences in executive resources, on functioning in young children. Specifically, 39 first grade children that varied in executive resources (working memory capacity, WMC), selected between two major regulatory strategies (reappraisal and distraction) to resist temptation, that varied in their resource demands, and were evaluated on successful functioning (via questionnaires completed by parents, that assess daily-life behaviours requiring executive functioning). Supporting SOC-ER predictions, we found that among children with low (but not high) WMC, choosing the less effortful distraction regulatory strategy was associated with adaptive functioning. Additionally, regulatory choice preferences previously obtained with adults were extended to children. Broad implications are discussed.

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Two 6-year old boys that diverge in their individual cognitive abilities crave a delicious cake they cannot have. To resist their desire, the boys can choose an easy way out with regulatory options that include disengaging from the cake altogether. For example, they can *distract* themselves by thinking about games they played earlier. Alternatively, they may choose a more effortful regulatory option that involves engaging with the cake. For example, they can still attend the cake but *reappraise* its taste as tasting bad. For each of the two boys which regulatory choices may be associated with adaptive outcomes? Based on the Selection, Optimization, and Compensation with Emotion Regulation conception (SOC-ER; Opitz, Gross, & Urry, 2012 for a review) – we suggest that *regulatory selections* that are sensitive to the *fit* between the cognitive requirements of regulatory strategies and individuals' cognitive abilities would be associated with adaptive functioning. Specifically, if one of the boys has low individual cognitive resources, choosing the less effortful disengagement strategy of distraction may be associated with adaptive functioning.

Although conceptually an interactive *fit* between regulatory *selection* and individual resources appears crucial for adaptive functioning among children, direct empirical evidence is lacking. Instead of examining the aforementioned interactive fit, existing relevant studies focused on the direct relationship between emotion regulation and adaptive delay of gratification among young children (see Mischel et al., 2011; Peake, 2017 for reviews). In many of

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these prior studies, the general experimental context involves the classic "marshmallow test", where young children need to regulate their desire to receive a small reward immediately, in order to receive a large reward following a delay (Mischel et al., 2011). In one type of studies (e.g. Mischel, Ebbesen, & Raskoff Zeiss, 1972) young children that were directly instructed to apply or implement strategies like distraction (e.g. looking away from temptation) and reappraisal (e.g. construing a white marshmallow as a little cotton ball), showed successful delay of gratification. While important, these studies did not look at how children select between available regulatory options.

In a second type of studies (e.g. Mischel & Ebbesen, 1970) young children spontaneously regulated their desire during the "marshmallow test". In these studies, while its quite likely that children selected between regulatory options, only the outcome of that selection (i.e. delay time) was assessed. A third type of studies demonstrated that children were able to select variants of distraction (i.e. cover up a reward), and more complex regulation strategies including reappraisal (i.e, think about the "cool" abstract elements of a reward), in order to successfully delay gratification (e.g. Mischel & Mischel, 1983) or to cope with distressing events (e.g. Davis, Levine, Lench, & Quas, 2010).

While prior studies offer critical insights into the relationship between emotion regulation and adaptive functioning in children, the present study was the first to examine the interactive fit between regulatory selection and individual resources and its association to adaptive functioning. Adaptive functioning broadly refers to behaviours, that favour long-term goals in the face of stressors and immediate temptations, which are associated with reduced distress and higher mental health (see Mischell et al., 2011 for a review). Central for the present focus, according to the SOC-ER framework (Opitz et al., 2012 for a review) populations with resource related challenges will have to choose less effortful regulatory options to reach adaptive functioning. SOC-ER further identifies children, who have not yet fully developed a complete set of cognitive resources, and older adults, who show cognitive decline, both face resource-related challenges (Craik & Bialystok, 2006).

The single indirect empirical support for the aforementioned interactive fit comes from a study demonstrating that among older *but not younger* adults, choosing a less effortful regulatory option was associated with adaptive functioning (Scheibe, Sheppes, & Staudinger, 2015). While clearly important, no study to date examined whether within the children population, particularly for those who face resource-related challenges, choosing less effortful regulatory options would be associated with adaptive functioning.

Accordingly, the present study tested a key tenet of the SOC-ER framework – whether the fit between a central individual cognitive resource ability, and selection between regulatory strategies (which require differential cognitive resources), is associated with adaptive functioning among first grade children. We focused on this age group, given prior work showing that by the age six, children are able to select and deliberately implement complex regulatory strategies (Davis et al., 2010, 2016. See verification below). Furthermore, individual resources and regulatory selection were assessed using performance based measures.

In the present study we focused on *WMC* (i.e. digit span test, WISC-IV; Wechsler, 2003) as our individual measure of cognitive resource ability, given the central theoretical focus it received in SOC-ER (Opitz et al., 2012), and given its central role in prior studies concerning self-regulation among children (e.g. Melby-Lervåg & Hulme, 2013).

For regulatory selection we focused on choices between two major regulatory strategies – *distraction* and *reappraisal* – that differ significantly in their resource demand (Sheppes & Gross, 2011). Specifically, distraction, that involves early attentional disengagement from emotional information processing using an independent neutral information stream, engages relatively simple cognitive processes (Sheppes & Gross, 2011). By contrast, reappraisal involves engaging with emotional information prior to re-interpreting its initial meaning at a late semantic meaning stage. Reappraisal involves a direct conflict between the original emotional appraisals and neutral reinterpretations, and thus engages relatively complex cognitive processes.

Direct empirical support for the influence of the differential resource requirements of distraction and reappraisal in regulatory selection comes from a finding in adults showing that simplifying the effort of generating reappraisals resulted in increased choice of reappraisal over distraction (Sheppes et al., 2014 Study 2). Developmental support for the differential requirement for resources in distraction relative to reappraisal comes from studies showing that

distraction is one of the first strategies to emerge in children, and studies showing that reappraisal in particular may be more difficult for young children (e.g. Ferri & Hajcak, 2015 for review). Although different in their resource demands both distraction and reappraisal were previously shown to aid young children delay their gratification (e.g. see Mischel et al., 2011 for review) and regulate their emotions (Davis, Quiñones-Camacho, & Buss, 2016).

For the present study we employed a modified ER choice task (Sheppes et al., 2014) that measures regulatory selection between distraction and reappraisal when needing to resist temptation. While the original ER choice task examined regulatory selection whose aim is to reduce the impact of negative stimuli (e.g. threatening emotional images or electric stimulation), this paradigm was recently extended to regulation of tempting appetitive stimuli (e.g. erotica and food images. See Sheppes et al., 2014). Accordingly, the present study employed a modified ER choice paradigm in an appetitive context where children were presented with *actual* toys and candy, and were asked to choose between reappraisal and distraction to down-regulate their desires.

To assess adaptive functioning, parents completed questionnaires that assess daily life behaviours that are associated with executive functioning, and that are crucial for goal-directed behaviour. Specifically, we chose the widely used Behavior Rating Inventory of Executive Functions (BRIEF; Gioia, Isquith, Guy, & Kenworthy, 2000). The BRIEF has been traditionally viewed as a cognitive measure of executive functions in children aged 5 to 18. However, more recent evidence showed that the BRIEF is directly related to general measures of behavioural functioning and impairment in children, and is used to identify youth at risk for the development of social and school related problems (e.g. McAuley, Chen, Goos, Schachar, & Crosbie, 2010). In addition to the BRIEF, we chose to use the Conners' Parent Rating Scale (CPRS-R; Conners, Sitarenios, Parker, & Epstein, 1998), which is a multimodal approach to the assessment of ADHD related problems in children and adolescents aged 3 to 17. We measured the CPRS-R because its assessment of behavioural problems that have relevance to self-regulation.

The main prediction of the present study was that greater relying on a less effortful *distraction* strategy would be associated with adaptive functioning among children that have *low* (but not high) WMC ability.

Secondary analyses[1] examined whether prior regulatory choice patterns observed with adults can be generalised to young children. Prior findings with adults have repeatedly showed that the preference for distraction over reappraisal increases as emotional intensity of tempting stimuli increases (Sheppes et al., 2014). Accordingly, we examined whether the same regulatory preference pattern would emerge in young children.

Method

Below we report how we determined our sample size, all data exclusions, all manipulations, and all measures that were collected in this study.

Participants

In conventional regulatory selection studies with adults, we typically have a sample size of 20 participants because of the large effect size (Cohen's $d = 2$, c.f. Sheppes, Scheibe, Suri, & Gross, 2011; Sheppes et al., 2014). However, given that in this study we examined the interactive effect of regulatory selection and WMC in children, we decided to try to double the sample size. Accordingly, 43 healthy first grade children completed the study at home for monetary compensation ($12.5 gift card). Four participants (9.3%) were excluded, two participants due to poor understanding of regulation instructions (failing to correctly employ reappraisal or distraction) and two participants due to poor compliance with instructions (eating candy throughout the experiment). Therefore, the final sample consisted of 39 participants (18 boys, Mean age = 6.96, SD = 0.28).[2]

Measures

WMC

Total number of correct responses in the classic digit span subtest of the Wechsler Intelligence Scale for children 4th edition (Wechsler, 2003) constituted our WMC measure (c.f. Ramirez, Gunderson, Levine, & Beilock, 2013) (mean across sample: 9.05, SD: ±2.61). In addition to our central theoretically driven WMC measure, we also administered three control subtests from the three remaining indices (Similarities from Verbal Comprehension index, Matrix Reasoning from Perceptual Reasoning matrix, Symbol Search from Processing Speed index).[3]

Regulatory selection task for children

The procedure was modified after Sheppes et al. (2014, Study 4). In a first *desire rating* part, following practice children were presented with a set of 30 emotional attractive objects (actual toys and candy that are popular in Israel[4]), in a random order and were asked to rate out loud how much they wanted each object on a 5 point Likert scale (1- don't want; 5- want it very much).[5]

In a second regulatory choice part, children were first asked in general about prior incidents in which they had to resist temptations and why it may sometimes be important. Following the convention in emotion regulation choice studies with adults (e.g. Sheppes et al., 2011, 2014), children were further motivated by emphasising several key real life examples where resisting temptation is clearly needed.[6] Then, children learned (4 trials) and practiced (6 trials) the two regulatory strategies. Distraction was named "unrelated" and involved producing neutral thoughts. Reappraisal was named "think different" and involved thinking about the stimulus in a way that reduces its negative meaning, (for *complete instructions* see the supplementary materials).[7] The actual task consisted of 30 trials. A stimulus (actual toy or candy) was first presented for 3 s and was then hidden in a sealed carton box. Children were then asked to choose the strategy that would best help them resist temptation. The same stimulus was then presented for 5 additional seconds and children were asked to explain out loud how they implement their chosen strategy. Explaining out loud during implementation, was important in order to ensure: a) that children chose the strategies they meant to b) that the amount of time was sufficient for children in order to implement regulatory strategies, c) that actual implementation of distraction and reappraisal was correct (c.f., Sheppes et al., 2011 Experiment 2 for a similar procedure). Finally, children were asked to report how much the strategy helped them resist.[8] Distraction choice was calculated as the proportion of trials in which distraction was selected out of the total number of trials ($N = 30$)[9] (mean across sample: 0.48, SD: ±0.24).

Behavior rating inventory of executive functions (BRIEF)

The BRIEF (Gioia et al., 2000) is a rating scale measure, used to assess behavioural functioning in children aged 5–18 in their home environment (e.g. McAuley et al., 2010). The BRIEF contains 86 items and produces eight clinical subscales (Inhibition, Shifting, Emotional Control, Initiation, Working Memory, Planning/Organization, Organization of Materials, and Monitoring), two indexes, and a global score. Parents rated the frequency of each item on a 3-point Likert scale ranging from never (0) sometimes (1) to often (2).[10] The global BRIEF score was used as a dependent variable (Cronbach's alpha = 0.97). Higher scores on the BRIEF are indicative of a higher degree of dysfunction (mean across sample: 50.18, SD: ±10.37).

Conners' parent rating scale (CPRS-R)

The CPRS-R (Conners et al., 1998) is a multimodal approach to the assessment of behaviour problems in children and adolescents aged 3 to 17. It is used to assess behaviours associated with ADHD and other developmental disorders. We used a shortened version consisting of 28-items, where parents rated the frequency of each item on a 4-point Likert scale ranging from not at all (0) to very much (3).[11] The total CPRS-R score was used as a dependent variable (Cronbach's alpha = 0.94). Higher scores on the CPRS-R are indicative of a higher degree of pathology or dysfunction (mean across sample: 21.18, SD: ±15.40).

Procedure

Following the first rating part of the ER choice task, children completed two (one verbal and one performance counterbalanced) intelligence subtests. Then, they completed the second regulatory choice part followed by the remaining two intelligence subtests.

Statistical analysis

To examine our main prediction regarding the interaction between regulatory choice and WMC on general functioning, we employed Hayes's (2013) PROCESS bootstrapping command (model 1, Hayes, 2013). Distraction choice (the less effortful strategy), digit span score and BRIEF or CPRS-R scores were treated as independent variable, moderator and outcomes, respectively.

In this regression model the conditional effects (namely the *B*-values or coefficients) are conventionally viewed as proxies of effect size. For all analyses we provide model fit estimates that include *R* square, *F*-value and *p*-value of the overall model as well as the R-square increase due to the interaction. Furthermore, as both the independent and moderator

variables (distraction choice and working memory capacity) are continuous variables, the conventional visual representation of the findings involves a line format which includes the slope of the regression line in two values of the moderator [one standard deviation above and below the mean of the WMC score].

Results

Zero order correlations between all measures are reported in Table S1 in supplementary materials.

The interaction between regulatory choice and WMC is associated with healthy functioning

The estimate of the coefficients and their significant levels are described in Table 1. The general model was significant for the global BRIEF score [$R^2 = 0.29$, F (3, 35) = 4.97, $p < .01$]. While somewhat counterintuitive, the notion that WMC did not predict BRIEF scores is consistent with previous findings (e.g. McAuley et al., 2010) and with the notion that the BRIEF is more strongly related to general measures of behavioural disruption and impairment than to scores on performance-based tasks of executive function (see McAuley et al., 2010).

Importantly, consistent with our hypothesis, there was a significant large effect sized interaction ($B = 7.78$, standard error [SE] = 2.15, $t = 3.63$, $p < .001$; 95% confidence interval [CI] = [3.41, 12.14]) between regulatory choice and WMC that accounted for an additional 26% of the variance above and beyond the main effects.[12] Follow-up analyses involved computing bootstrapping confidence intervals (95%) to evaluate the magnitude of the relationship between regulatory choice and general functioning for children with low (−1SD), and high (+1SD) WMC (see Table 1 and Figure 1).

We expected and found that greater relying on the less effortful distraction strategy is associated with adaptive functioning among children that have low WMC ability ($B = -31.96$, SE = 9.13, $t = -3.49$, $p < .01$; 95% CI = [−50.50, −13.42]). Among low WMC children, as the minimally effortful distraction choice increases dys-functioning symptoms decreases. No relationship between regulatory choice and general functioning was found among children with high WMC ($B = 8.74$, SE = 7.84, $t = 1.11$, *n.s.*; 95% CI = [−7.18, 24.68]).

To provide further support for the robustness of the interaction between WMC and regulatory selection on the BRIEF scale we corrected the p value for multiple comparisons (additional Bayesian analyses that strongly support our findings are reported in the supplementary materials). Specifically, to minimise Type I error, we applied a modified Bonferroni correction (Holm's test) for the p value of the aforementioned interaction. We used the most stringent p value correction that accounts for all possible effects among all of the collected measures (i.e. 24 effects that are composed of 4 intelligence sub-tests × 2 dependent variables × 3 possible effects including two main effects and one interaction). Specifically, the p value of our observed interaction (exact $p = .0009$) was lower than the adjusted p value ($p = .002$).

Contrary to expectations, when we repeated the aforementioned analyses using CPRS-R score as outcome, the general model was not significant [$R^2 = 0.10$, $F(3, 35) = 1.30$, $p = 0.28$] (see Table S2 in supplementary materials for complete details).

Extending prior adult regulatory choice patterns to children

Extending prior regulatory choice patterns observed with adults to children's regulatory choices, we expected that the preference for distraction over reappraisal would increase as the intensity of desire

Table 1. Estimated coefficients, standard errors and 95% confidence intervals for independent and moderator variables in the model predicting general functioning. The last two rows represent follow up analyses and show the conditional effects of regulatory choice on the BRIEF global score for individuals with low (−1SD) and high (+1SD) working memory capacity.

Variables	*B*	S. E	*t* value	95% confidence interval Low	95% confidence interval High
BRIEF Global					
WMC	−1.11	.64	−1.73	−2.41	0.19
% Distraction Choice	−11.60	6.39	−1.81	−24.58	1.37
WMC X %Distraction Choice	7.78	2.15	3.63**	3.41	12.14
Follow up analyses					
Low WMC (−SD)	−31.96	9.13	−3.49**	−50.50	−13.42
High WMC (+SD)	8.74	7.84	1.11	−7.18	24.68

*$p < 0.05$ **$p < 0.01$.

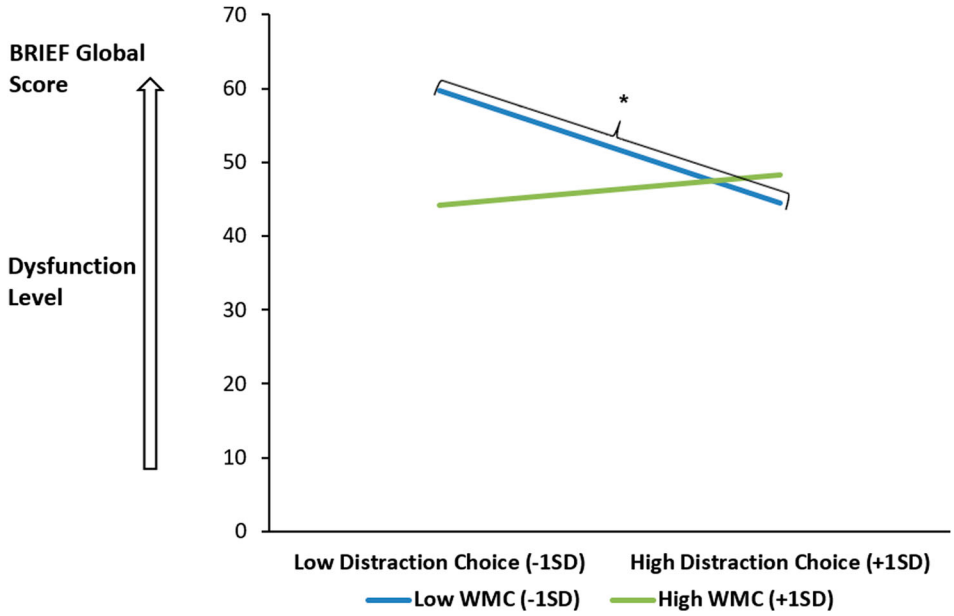

Figure 1. The relationship between distraction choice and general functioning for children with low and high working memory capacity.
Note: The bracket refers to the difference in the BRIEF global score between low (−1SD) and high (+1SD) distraction choice individuals with low (−1SD) WMC. *$p < .01$.

increases. Confirming our prediction, when we performed a customised median split of desire ratings for each child[13], we found that distraction choice was greater for high ($M = 0.52$, SD = 0.25) relative to low ($M = 0.43$, SD = 0.25) desire intensity stimuli ($t(38) = -3.11$, $p < .01$, $\eta_p^2 =$, 0.20, 95% CI = [−0.15, −0.031]).

Discussion

The present study examined for the first time whether the fit between individual resources and selection of regulatory strategies that vary in cognitive resources, is associated with adaptive functioning among young children. Supporting and extending the SOC-ER predictions (Opitz et al., 2012), we showed that greater choice of a less effortful distraction strategy was associated with adaptive functioning among children that have low (but not high) WMC ability. Confirming our secondary prediction and extending prior adult results, we found that young children showed an increased preference for distraction over reappraisal as intensity of desire increased.

Prior work provides critical insights regarding the relationship between emotion regulation and adaptive delay of gratification (Mischel et al.,2011; Peake, 2017 for reviews). While clearly important, these studies did not directly examine regulatory selection (see Davis et al., 2010 for an exception), a regulatory stage that has been recently identified as critically important for adaptive functioning (see Sheppes, Suri, & Gross, 2015 for a review). Importantly, the present findings demonstrate that among young children the influence of regulatory selection should be considered with individual executive abilities. Specifically, contrary to classic approaches suggesting that regulatory options that involve disengagement are inherently maladaptive (Bonanno & Burton, 2013, for a review), our findings show that distraction choice may not only be adaptive in certain adverse situations, but it may also be adaptive for certain children that lack adequate executive resources.

How do children with low WMC *know* to choose regulatory strategies that match their abilities? One central way to obtain relevant knowledge is via high meta-cognitive awareness ability (Whitebread, 1999). While the combination of low WMC with high meta-cognitive awareness may seem counterintuitive, it is nonetheless possible, given prior studies that find relative independence (i.e. low correlations) between the two executive abilities among young children (e.g. Bryce, Whitebread, & Szűcs, 2015; Whitebread, 1999). Furthermore, children with low WMC and low levels of meta-cognitive awareness can still choose strategies that fit with their capabilities, if they are taught and encouraged to use particular strategies by their caregivers or teachers (Baker, 1994).

Beyond meta-cognitive awareness and WMC, other core cognitive executive functions may be important for adaptive regulatory selection. Specifically, previous research suggests that preschool children's performance on behavioural measures of inhibitory control was associated with their ability to regulate emotions (e.g. Carlson & Wang, 2007). Thus, future studies should examine whether the fit between individual differences in these executive abilities and emotion regulation choice is crucial for adaptive functioning, as well as the contribution of parental influences.

From a developmental perspective, children, who have not yet fully developed a complete set of cognitive resources, and older adults, who show cognitive decline, both face resource-related challenges (e.g. Craik & Bialystok, 2006). Accordingly, matching regulatory choices to individual abilities by relying on *less* effortful regulatory strategies may be important for successful adaptation among both age groups. Congruent with this notion, a recent study found that among older adults increased distraction over reappraisal choice was associated with adaptive functioning (Scheibe et al., 2015).

More generally, some studies called into question children's ability to use complex cognitive regulatory strategies at young age, arguing that children do not fully understand that feelings can be changed by thoughts alone before the age of 7 or 8 years old (e.g. Bamford & Lagattuta, 2012). However, other studies have clearly showed that pre-school children can use complex regulatory strategies to resist temptation (Mischel et al., 2011 for a review) and to down-regulate negative emotions (Davis et al., 2016). The present study adds to these latter findings in showing that children were able to adequately execute distraction and reappraisal in a controlled lab context (verified via having participants talk out loud during implementation). Furthermore, finding that young children show an increased preference for distraction over reappraisal as intensity of desire increases, suggests that children not only adequately execute regulatory strategies, they are also able to flexibly choose between regulatory options according to differing situational demands.

The current study has several limitations. First, although our predictions were strongly confirmed when using the BRIEF as outcome, predictions were not confirmed with the CPRS-R. While the BRIEF is considered a clinical tool for assessing a broad range of behavioural difficulties in children (e.g. McAuley et al., 2010), the CPRS-R is considered more specific to ADHD associated behaviours. Accordingly, future work should examine the boundary conditions of different outcome measures.

Second, our study entailed a cross sectional design, which does not allow to test whether the ability to make adequate regulatory selection (whose resource requirements fit with WMC abilities) functions as an antecedent or consequence of adaptive functioning. Thus, as opposed to our account, it is possible that individual differences in functioning predict how well children choose regulatory strategies the fit with their WMC abilities. Nevertheless, our study provides a proof of concept that regulatory selection is an important variable in the relationship between WMC and healthy functioning. However, in order to establish its causal role, a longitudinal study that separates the measurement time of regulatory selection from healthy functioning is needed.

Third, it is important to consider that in real life settings certain goals such as obtaining immediate rewards may be more salient and thus challenging. In these cases, low-resource children may be required to shift more towards selecting simpler strategies.

Fourth, although our view of WMC as a stable trait that remains largely constant over time is shared by others (e.g. Conway et al., 2005; Schweizer, Grahn, Hampshire, Mobbs, & Dalgleish, 2013), WMC may have been influenced by situational factors. Prior findings have showed that WMC performance can be impaired by fatigue and sleep deprivation, stress and noise (e.g. Dirk & Schmiedek, 2017) as well as findings showing that WMC can be enhanced via extensive (specific) training (e.g. Schweizer et al., 2013). Accordingly, future studies should try to account for these situational factors.

The present study examined whether the fit between individual resources and selection of regulatory strategies that vary in cognitive resources, is associated with adaptive functioning among young children. Extending the SOC-ER model (Opitz et al., 2012) and prior work on emotion regulation in children (e.g. Davis et al., 2016; Mischel et al., 2011), our findings indicate that choosing less effortful regulatory strategies may be adaptive for certain children that lack adequate executive resources.

Notes

1. Our conceptual framework (Sheppes & Levin, 2013) and recent empirical findings with adults using normative emotional pictures that vary in their appetitive intensity levels (Hay, Sheppes, Gross, & Gruber, 2015; Martins, Sheppes, Gross, & Mather, in press; Sheppes et al., 2014)

clearly led us to predict that distraction choice would increase as appetitive intensity increases. However, given significant methodological differences in the present study (i.e. studying young children instead of adults, and replacing standardised images with age appropriate candy and toy stimuli that have no normative intensity norms), we wished to remain cautious by describing this prediction as secondary.

2. To provide further support for the adequacy of the final sample size, we used the *observed* large effect size of the interaction between WMC and regulatory selection (eta square = 0.351, see Results section), in a power analysis using the Gpower software. This analysis indicated that a sample size of 25 subjects (which is considerably lower than the 39 participants that completed our study) would be sufficient to detect a significant interaction effect with a power of .80 and an alpha of .05.
3. Below we additionally show that the main results reported in this study remain unchanged when considering the influence of these measures.
4. Toys and candy used were as follows: three types of chocolate, a bag of cookies, five types of Israeli children's snacks, a box of crayons, balloons, three types of children's card games, a puzzle, a hoop, marbles, sun glasses, stickers, a ball, a spring, toffee, Mentos, waffles, marshmallows, gummy bears, lollipops, soap bubbles, stress ball and Play dough.
5. The degree of reporting an item as "undesirable" was low ($M = 12.82\%$; $SD = 9.15\%$; Minimum = 0% Maximum = 35.8%).
6. Examples included: "you really want to play with a toy when it is not your turn; "you go with your parents to the supermarket and ask them to buy you a lot of candy but they only agree to buy you one"; "sometimes you get lots of candy but want to save some, so that you could enjoy them tomorrow".
7. Similar to experimental procedures of the ER choice task in adults (Sheppes et al., 2011, 2014), children were allowed to use examples of their own so long as these examples were congruent with the definitions of distraction and reappraisal.
8. Note that self-report ratings are un-interpretable with regard to differential effectiveness of employing distraction and reappraisal under different emotional intensities. Because participants freely choose between reappraisal and distraction, and because participants prefer to reappraise low intensity stimuli and distract high intensity stimuli, the emotional content and its intensity are not held constant across the two regulatory conditions (see Scheibe et al., 2015 for a thorough discussion).
9. None of the children unanimously selected distraction or reappraisal.
10. Sample items from the BRIEF include: "over reacts in response to minor issues"; "gets frustrated easily"; tends to lose control more than his peers".
11. Sample items from the CPRS-R include: "his demands must be answered immediately"; "impulsive, gets easily excited"; "doesn't finish what he started"; denies his mistakes or blames others"; "shows rapid and extreme mood changes").
12. We chose to focus on the average distraction choice, although a significant interaction between regulatory choice and working memory when considering differential intensity levels [for low intensity ($t = 4.81$, $p < .01$) as well as for high intensity ($t = 2.66$, $p = .01$)].
13. Findings in the original ER choice task obtained with adults used a dichotomous categorization (i.e., Low versus high) of emotional intensity based on IAPS norms. Given that there are no intensity norms for stimuli used in our novel regulatory selection task, we performed a customised median split of desire ratings for each child to obtain desire intensity scores that most closely match those obtained with adults.

Disclosure statement

No potential conflict of interest was reported by the authors.

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