



An imagery rescripting based intervention in children and adolescents who endured a negative life event: A pilot study, satisfaction and feasibility survey

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ABSTRACT

Background and objectives: ImRs, a technique targeting distressing mental images, has shown promise in adult psychiatric treatment. Initial research indicates positive outcomes in children, with potential for reducing mental health care burden. This pilot study examined the use of Imagery Rescripting (ImRs) as an intervention for children who have experienced negative life events. We aimed to assess short-term emotional changes, participant satisfaction, and the feasibility of a larger-scale ImRs intervention for children.

Methods: We employed a pre-posttest within-group design, and included 35 children (ages 5–18) who experienced negative life events, as well as 12 coaches. ImRs targeted distressing images related to negative events. Measurement tools included Visual Analogue Scales for distress and emotions, along with satisfaction surveys for both children and coaches. The feasibility of a larger-scale study was also explored through a coach questionnaire.

Results: We found significant short-term improvements for all emotional states, with large effects for anxiety, sadness, and happiness, and a moderate effect for anger. Children reported fair levels of satisfaction with the intervention's acceptability and complexity. Coaches expressed high levels of satisfaction with the intervention as a whole and with its characteristics. Coaches were also strongly motivated for future, more in-depth research. An important limitation of this pilot study was the lack of a control group. In light of the promising results, more extensive studies with diagnostic information, multiple measures, and follow-up assessments are warranted.

Conclusion: Altogether, imagery rescripting based interventions seem a promising venue for children who experienced negative events.

1. Introduction

Mental imagery, defined as perceptual information originating from memory rather than directly sensed, encompasses various sensory modalities, including auditory and visual experiences (Kosslyn, 1994). Mental imagery can be pleasant and adaptive, but can also be distressing. In relation to psychopathology, numerous studies showed that individuals with depression, OCD, and other psychiatric conditions experience negative thoughts accompanied by remarkably vivid mental images and sounds (Holmes et al., 2016; Moritz et al., 2014; Röhlinger et al., 2015). Distressing mental images can be manipulated by a range of therapeutic approaches, such as imagery rescripting (Morina et al., 2017).

Imagery rescripting (ImRs) is an imagery technique that specifically targets psychological challenges associated with distressing mental images (Edwards, 2007). During ImRs, the individual is guided through the process of evoking distressing memories related to negative events and subsequently reimagining them in a way that envisions a different and

more positive outcome (Arntz & Weertman, 1999; Boterhoven de Haan et al., 2020). The primary aim of ImRs is to facilitate the transformation of distressing mental images into more pleasant and adaptive ones (Holmes et al., 2007). ImRs primarily operates within the visual domain, focusing on altering distressing images, rather than relying on verbal elements for change (Arntz et al., 2007; Holmes et al., 2007; Morina et al., 2013). A meta-analysis conducted by Morina et al. (2017) demonstrated strong positive effects of this intervention in adult populations. They stressed the need for research on the effectiveness of ImRs in children and adolescents.

Schwarz and colleagues' literature review (2020) highlights the potential of ImRs as an intervention for children who exhibit mental health difficulties. Indeed, children and adolescents exhibit a stronger reliance on image-based processing than adults (Pile, Smith, & Lau, 2021a), making ImRs an engaging alternative for children to verbal cognitive techniques (Lau-Zhu et al., 2022), known for its ease of information processing (De Voogd et al., 2017). Although research on ImRs in children and adolescents is limited, initial findings are

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encouraging. As in adults, ImRS in children consists of evoking and reimagining distressing memories, and can be presented in a playful manner. Pile et al. (2021b) reported significant positive effects in a four-session intervention ($n = 9$) targeting adolescent depression, anxiety, self-esteem, and memory specificity. These outcomes were reaffirmed in a larger sample ($n = 56$) undergoing a novel imagery-based cognitive behavioral intervention for depression (Pile et al., 2021c). Moreover, Nelius and Ahrens-Eipper (2017) demonstrated improvement through ImRs and reprocessing therapy in children aged 4–14 with mental health difficulties ($n = 13$). Additionally, four single case studies on ImRs in children (Davis et al., 2003; Fernandez et al., 2013; Prerost, 1984; Waldron et al., 2018) consistently reported promising results. Given the importance of efficient allocation of mental health resources, it is crucial to provide accessible healthcare for youth to prevent mental health issues from worsening or becoming chronic. Interventions based on ImRs may reduce the burden on specialized mental health care services (Patel et al., 2007). The flexibility of this technique allows it to be employed as a standalone intervention or in conjunction with other therapeutic approaches. Further research is essential to deepen our understanding of the utility and applicability of ImRs-based interventions for child and adolescent psychopathology.

Therefore, in the current study, we aim to shed a light on the use of an ImRs-based intervention for children. We focused on children who have experienced a negative life event. Negative life events are discrete and time limited events, such as parental divorce, problems with school and bereavement. Negative life events in children and adolescents are associated with decreases in psychological functioning (e.g., Sandler & Ramsay, 1980), such as the development of posttraumatic stress disorder (Jin et al., 2019). Distressing mental images after negative events are a common phenomenon (e.g., Morina et al., 2013). Children and adolescents who have been through a negative life event commonly create aversive mental images, such as nightmares and future imaginings (Schwarz, 2020).

We performed a pilot study on an ImRs-based intervention for children and adolescents (from now on referred to as children) who experienced a negative event. Our examination of the ImRs-based intervention involved three steps. Firstly, we aimed to gain insight in the short-term changes in emotional states after participants took part in the intervention. We expected significant decreases in feelings of anxiety, sadness and anger, and a significant increase in happiness. Secondly, we investigated the satisfaction of both children and coaches regarding the intervention. Thirdly, we explored the feasibility of conducting a larger-scale study on ImRs for children who have experienced negative events. We explored how coaches perceived the practicality of conducting a larger-scale and more intensive investigation into the effect of the intervention.

2. Material and methods

2.1. Design

This pilot study had a pre-posttest within-group design, without a control group. Children filled out questions on their emotions before and after the intervention. Both children and coaches completed a satisfaction survey after the intervention. Coaches filled out a survey on their ideas to conduct a large-scale study on the effects of the intervention.

2.2. Participants

There were two types of participants in this pilot study: children and coaches. With respect to the children, we included children in the age range of 5–18 years and who experienced a negative event, such as bullying, divorce of parents, or death of a significant other. Exclusion criteria consisted of substance abuse and having no request for help or motivation for coaching. A power analysis (GPower, Faul et al., 2007) based on a paired-sampled t -test with $\alpha = 0.05$ showed we needed 36

children to take part, in order to achieve a power of 0.90. Children were recruited via coaches working at private practices. The parents of these children voluntarily contacted the private practices after their child experienced a negative event. Coaches then asked the children to participate in the current pilot study. No diagnostic information of the children was present. There were 37 children who took part in the pilot study, amongst whom were two children who did not complete the instruments and were therefore excluded, leading to a final sample size of $n = 35$.

Regarding the coaches, 12 coaches voluntarily took part in this pilot study after being asked by their trainer. We only included coaches who held at least a bachelor degree in health care, teaching, or pedagogy, and who were trained and certified to provide this intervention. The training of the coaches consisted of 1) a face-to-face training (24 h) or a blended training (30 h) in order to learn the theoretical principles and methods of the intervention and 2) a supervised practical period (35 h). Aside the request of adhering to the inclusion criteria of the children, there were no exclusion criteria for coaches. All coaches had their own practice, which were located at various locations throughout the Netherlands.

2.3. Intervention

The intervention for targeting negative events was developed to help children overcome difficulties due to negative life events. The intervention, named MatriXmethod, is based on imagery rescripting (ImRs), and consecutively consists of selecting the targets, imaging the aversive image, identifying the aspects of the image that need to be changed and activating the changed image. The intervention is adapted to the developmental needs of children. That is, the coach used short and easy phrases and offered the ImRs with easy and playful instructions. In each session of the MatriXmethod, the focus is on one specific negative event. This event can be an event in the past or an event in the future. In this study, only one session was evaluated.

The selection of targets refers to the identification of a distressing memory related to the negative life event the child experienced. The coaches instructed to children to focus on one moment (millisecond) of that memory and choose one target, e.g. the eyes, knife, blue sweater, teeth of the dog or dental drill. This specific memory with this specific target needs to be negative for the child and needs to evoke negative feelings and/or be associated with a sound, a smell, or a thought. The coach did not ask the child to verbalize the memory or the target. In other words, children kept the specific content of the negative life event to themselves. The children then indicated their Subjective Units of Distress (SUD, Wolpe, 1969) related to the targets. SUD specify (SUD, Wolpe, 1969) the intensity of momentary distress, such as painful emotions, experienced by a person (Benjamin et al., 2010). The children could indicate the SUD on a 0–10 Visual Analogue Scale, where a higher score indicated a higher level of subjective distress. Thereafter, the coach instructed the children to image the target as vividly as possible. Then, the coach asked the children to identify what aspects of the aversive image needed to be changed. The coaches instructed the children to change the aversive image into a more desired image, either with or without introducing (imagined) trustworthy helpers to achieve this desired image (Kunze et al., 2019). The coach aimed to bring the targets' SUD back till an intensity of zero during the rescripting. The coach offered the child protocolled ImRs techniques and used fixed questions (e.g., "What makes the picture so negative?"), which the child independently used to apply perceptual changes in the target (e.g. "What do you want to do to this detail? Erase it?"). If necessary to bring back the intensity further down after finishing the ImRs to one modality, other modalities (e.g., hearing) could be opted to rescript the targets. For each modality, the techniques and fixed questions were described in a manual. In the final step, the children activated the changed image. An additional option was to end with a positive visualization exercise. During the first step of the positive visualization exercise, the coach stimulated the child to create a mental picture of a future self that is

powerful and positive and to associate this to a sound, sense, smell, taste and thought. The coach then asked the child to think, without sharing, about the first step he/she can take towards this mental picture.

2.4. Measurements

All questionnaires were pen-and-paper questionnaires. Data are available via <https://osf.io/zu7ac/>.

2.4.1. Visual Analogue Scales (VAS)

We used VAS scales (e.g., Aitken, 1969; Wewers & Lowe, 1990) to indicate the child's Subjective Units of Distress (Wolpe, 1969), the child's emotions (i.e., emotion-scales), the child's satisfaction (i.e., satisfaction scale-child version), and the coach's satisfaction (i.e., satisfaction scale-coach version). The VAS functions as a psychometric measuring approach to examine emotional attributes and the severity of symptoms. An elevated VAS score indicates an intensified degree of emotional experience. The VAS scale can be regarded as a robust instrument suitable for children aged seven years and above (Shields et al., 2003).

2.4.1.1. Emotion-scales. The Emotion-scales assess the momentary strength of four emotions of the child before and after the intervention. The four emotions that were assessed were anxiety, anger, happiness and sadness. The emotion-scales ranged from 0 to 10 and were designed as thermometers. An emoticon and a word indicated the specific emotion. Children were instructed that the more the thermometer was filled, the more the emotion was currently present. Therefore, a relatively higher score represented a relatively more intense emotion. Completing the Emotion-scales took the child approximately 5 min.

2.4.1.2. Satisfaction scale-child version. The scale was used to gain insight into the perception of the child regarding the acceptability and complexity of the intervention. The questionnaire consisted of four scales ranging from 0 to 10. The scales were shaped as thermometers with symbols and the characteristic (i.e., stupid, fun, difficult, easy) depicted above the thermometer. Children were instructed that the more the thermometer was filled, the more the specific characteristic as present (e.g., the more fun they thought the intervention was). Consequently, a relative high score indicated the characteristic to be more present. Completing the satisfaction scale took the child approximately 5 min.

2.4.1.3. Satisfaction scale-coach version. The satisfaction scales for the coach were provided in order to assess the degree to which the coaches were pleased with the intervention. The questionnaire consisted of 16 scales ranging from 0 to 10 where a higher score indicated higher satisfaction. The items assessed the coaches' satisfaction with the entire intervention, the coaches' satisfaction of the intervention for children of different age classes and the coaches' satisfaction of various elements and characteristics of the intervention (e.g., working with visualization). There was also one open question (i.e., "if you had to change one thing about the intervention, what would that be?"). Completing the questionnaire took the coaches approximately 20 min.

2.4.2. Feasibility questionnaire for coaches

The feasibility questionnaire assessed the coaches' judgement of a possible future in-depth study on the effects of the intervention. This in-depth study would be larger and more intensive and would ask more of participating coaches and children. The questionnaire consisted of 10 open and closed questions with space to answer elaborately. There were two questions on the population of interest (e.g., "Do you think a larger study should also aim on children who experienced a negative event?"), one question on the assessment method (i.e., pen-and-paper or online), one question on the number of assessment points, one question on the

main outcome measure, three questions on the recruitment method (e.g., "Do you think it is feasible to recruit children via the normal referral route for a larger and more intensive study?"), one question on the coaches' willingness to participate in future research, and one closing question asking for any suggestions for future research. It took the coaches approximately 30 min to complete the questionnaire.

2.5. Procedure

Parent(s)/caregiver(s) contacted a coach for an intervention, to receive help with the child's suffering resulting from a negative life event. During this contact, the coach informed the parent(s)/caregiver(s) about the pilot study. Part of the standard procedure of coaches is to send an intake form, which coaches used to double check if the child and parent contacted the coach for help after suffering from a negative experience. If this was the case, the coach sent informed consents (see ethical considerations) to the children and their parent(s)/caregiver(s).

Before the intervention, the child indicated the current emotional state on four emotion-scales (i.e., pre-test). During the intervention, the coaches listed the specific exercises they provided as well as the duration of each exercise. Immediately after the intervention, coaches gave children emotion-scales once more to indicate their current emotional state (i.e., post-test). In addition, the children filled out a satisfaction survey. The coach informed the child that the coach was instructed not to help or monitor the child while completing any of the scales, nor to check the scales afterwards, in order to reduce socially desirable answers to a minimum. Furthermore, the coaches completed their own measurements, consisting of a satisfaction and a feasibility survey. There was no mandated moment at which the coaches were to fill these out, as long as they were returned before the end of the research period. The coaches sent their surveys back to the first author, who had no personal nor professional connection to the coaches or the participating children and their parent(s)/caregiver(s).

2.6. Ethical considerations

The ethical committee of the [anonymized for the review process] approved this pilot study. The children were asked to participate in the pilot and fill out the satisfaction survey after they applied for the intervention. The intervention session was planned at least one week after sending the informed consent, so to provide the child and its parents time to contemplate on participating in the study. Both the children and their parents were informed about the pilot study. If children were younger than 12 years of age, parents signed informed consents. If children were 12 years–16 years of age, both the child and the parents signed informed consents. If the child was age 16–18 years, only the child themselves had to sign informed consents. The coaches also signed informed consents for themselves to take part. The informed consents of the children and the coaches were saved separately from their data as data were stored anonymously. Coaches were informed beforehand that, although their answers were processed anonymously, the possibility of identification due to the small sample size of participating coaches was present. However, all data were treated respectfully and were only accessed by the first author.

2.7. Statistical analyses

The data were entered and analyzed in Jamovi (version 2.3) and the IBM Statistical Package of Social Sciences (SPSS, version 26). The short-term effects of the intervention on emotional states was examined with pre-post analyses with four separate paired-samples t-tests. In case of non-normality of the data, a non-parametric variant of the statistical test was applied. A significance level of 0.05 was applied for all analyses. Additionally, Cohen's *d* was used to gain insight into the effect sizes, which can be qualified as small (i.e., <0.05), moderate (i.e., <0.08), and large (i.e., >0.08, Cohen, 1988). The satisfaction and feasibility were

assessed with descriptive statistics.

3. Results

3.1. Descriptive statistics

The group of children ($n = 35$) had a mean age of 12.06 ($SD = 2.82$; range: 6–18) and included 14 boys (40%), 20 girls (57%) and one child who did not provide gender information. Boys and girls had comparable ages, $t(32) = -0.76$, $p = 0.455$.

The group of 12 coaches included one male (8%) and 11 females (92%) and had a mean age of 51.42 ($SD = 6.80$). All coaches filled out the satisfaction and feasibility surveys and eight of these coaches included children (range of included children: 1–7). We wanted to get an indication of possible differences in outcome measures related to the number of children coaches included. To this end, we compared difference scores (pre-post) of the outcome measures of coaches ($n = 4$) who included 1–4 children to those coaches ($n = 4$) who included more children, and found no differences, all p 's > 0.10 . The coaching session had a duration of $M = 36.90$ ($SD = 20.50$, range: 10–79), of which the coaches spent $M = 20.40$ min ($SD = 12.30$, range: 5–53) on rescripting the negative event and 16.50 min ($SD = 19.1$, range 0–53) on other elements, such as explaining ImRs, or empowering the child.

Regarding the outcome measures, the variables anger and anxiety had normal distributions, but the variable sadness (skewness = 0.26, SE = 0.40; kurtosis = -1.63, SE = 0.78) and happiness did not have normal distributions (skewness = 0.10, SE = 0.41; kurtosis = -1.60, SE = 0.81). We, therefore, used Wilcoxon Matched-Pairs Test to assess changes in sadness and happiness.

3.2. Intervention's short-term effects on child emotions

The children reported a significant decrease in anger from pretest ($M = 2.80$, $SD = 3.09$) to posttest ($M = 1.09$, $SD = 2.15$), $t(34) = 4.52$, $p < 0.001$, Cohen's $d = 0.76$. Children also reported a significant decrease in anxiety from pretest ($M = 3.46$, $SD = 3.36$) to posttest ($M = 0.97$, $SD = 2.28$), $t(34) = 5.39$, $p < 0.001$, Cohen's $d = 0.91$. Additionally, sadness decreased significantly from pretest ($M = 4.20$, $SD = 3.82$) to posttest ($M = 1.34$, $SD = 2.13$), $Z = -4.14$, $p < 0.001$, Cohen's $d = 0.91$. Finally, children reported a significant increase in happiness from pretest ($M = 4.13$, $SD = 3.63$) to posttest ($M = 7.79$, $SD = 2.42$), $Z = -4.55$, $p < 0.001$, Cohen's $d = 1.19$. Fig. 1 depicts the changes in the intensity of children's emotions.

3.3. Satisfaction survey

Regarding the acceptability of the intervention, children scored as

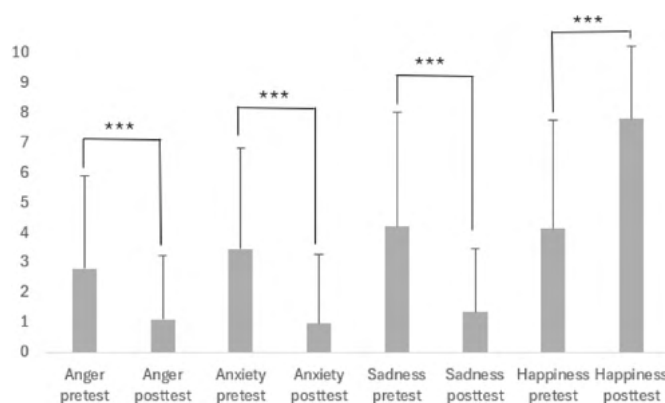


Fig. 1. Emotions (M , SD) of the children ($n = 35$) before and after the intervention.

Note. *** $p < 0.001$.

follows on 'stupid' ($M = 1.39$, $SD = 2.22$), and 'fun' ($M = 6.91$, $SD = 2.57$). With respect to the complexity of the intervention, children scored as follows on 'difficult' ($M = 4.24$, $SD = 2.54$), and 'easy' ($M = 5.76$, $SD = 2.42$). Fig. 2 depicts the coaches' opinions about the intervention when applied to negative events. The coaches' opinions differed strongly regarding the best age for children to benefit from the intervention: 3–18 years ($n = 1$, 8%); 5–18 years ($n = 3$, 25%); 7–18 years ($n = 1$, 8%); 8–12 years ($n = 1$, 8%); 8–18 years ($n = 1$, 8%); 9–18 years ($n = 1$, 8%); 12–18 years ($n = 2$, 16%); older than 18 years ($n = 1$, 8%). There were 5 coaches (42%) who think the intervention is only suitable for decreasing the load of negative events, whereas others ($n = 7$, 58%) forward the intervention is suitable for other aspects of psychological functioning too (e.g., chaotic minds). Half of the coaches did not provide an answer to the question "If you had to change one thing about the intervention, what would that be?"; and 3 (25%) coaches did not provide relevant answers. One coach (8%) forwarded that the distress should not necessarily be discharged to zero, one coach (8%) suggested that the processing of the coaching could be enhanced by having children read relevant comic strips, and one coach (8%) stressed that coaches should immediately start coaching actual clients after finishing their training.

3.4. Feasibility survey

The coaches also provided their opinion on the feasibility of a future study on the effects of the intervention for children. The majority of coaches ($n = 9$, 75%) believed that performing 1–3 follow-up assessments (1 follow-up assessment: $n = 1$, 11%; 2 follow-up assessments: $n = 5$, 56%; 3 follow-up assessments $n = 3$, 33%) would provide the most valuable information on the effects of the intervention in a future study. The period between these proposed follow-up assessments ranged considerably; from 2 days to 1 year. The other coaches indicated that a pre-post design would be most suitable ($n = 3$, 25%). Not one of the coaches preferred multiple pre-assessments or other designs. The majority of coaches suggested to only assess changes on the four emotions again ($n = 8$, 67%), three coaches (25%) wanted to expand the outcome measures (e.g., with social well-being), and one (8%) suggested to study other outcome measures than the four emotions. The route of referral used for the current study should be used in a future study too for 7 coaches (58%), whereas the other coaches (52%) indicated that the referral route should be expanded to schools, other child institutions and online advertising. Most coaches believed that completing the assessments with 'pen and paper' ($n = 8$, 67%) would be more suitable for a future study than using an online tool ($n = 4$, 33%). The large majority of the coaches wanted to participate as a coach in a future study ($n = 11$, 92%), one coach did not provide an answer to this question. There were five coaches (42%) who provided suggestions for future research. One coach suggested to explain the intervention in more detail to participants and their parents. Another coach forwarded that the coach and the child should have a talk before the post assessment. A next coach suggested a model video to instruct participating coaches. One coach held the opinion that 3–8 year old children should not be included in future studies. The final coach believed that children would profit more from the coaching session if they first received help with regulating chaotic minds.

4. Discussion

Negative life events can affect psychological functioning negatively. Although ImRs already is an evidence-based intervention for adults, evidence on the effects of ImRs in children and is scarce. In this pilot study, we examined the short-term effects of an ImRs-based intervention for children who endured a negative life event. We applied a pre-posttest within-group design, without a control group. In addition, we assessed the children and coaches' satisfaction with the intervention, as well as the coaches perception on the feasibility of a larger-scaled study on ImRs

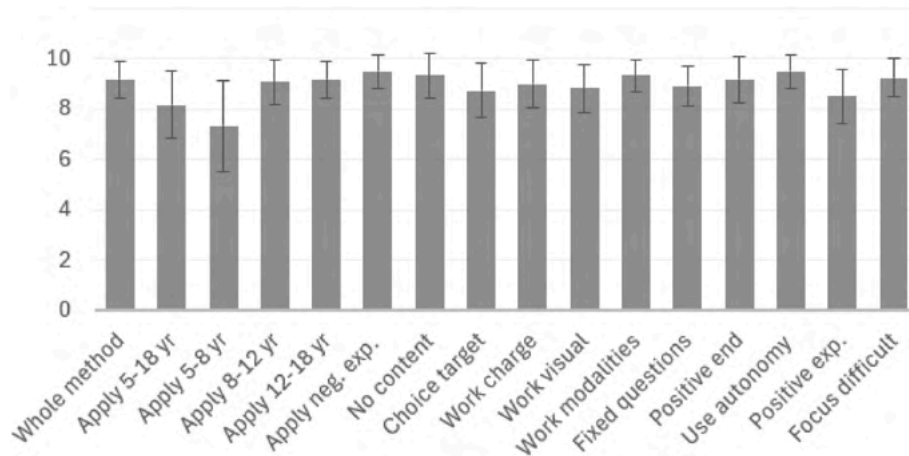


Fig. 2. Satisfaction (M , SD) of the coaches ($n = 12$) with intervention elements.

in children.

The study revealed significant short-term improvements in all assessed emotions after one session. Large effects were obtained for the emotions anxiety, sadness, and happiness, and a moderate effects for anger. These findings suggest the potential use of ImRs for children who experienced a negative life event. In line, studies of adults who followed ImRs after having been through a negative event with large effect sizes (Morina et al., 2017) showed positive effects. Although studies on ImRS with children are scarce, previous studies also found promising effects (e.g., Davis et al., 2003; Fernandez et al., 2013; Nelius & Ahrens-Eipper, 2017; Pile et al., 2021c). Note that, in the current intervention, children did not verbalize the content of their memories yet large effect sizes were obtained. Disclosing the content of the memories may, therefore, not be a crucial ingredient of ImRs, which is of interest given the search for the therapeutic change agents of ImRs (e.g., Kunze et al., 2019).

With respect to the satisfaction survey, the children gave their opinion on the quality of the session, and the coaches gave their opinion on several facets of the intervention. Overall, children reported fair levels of acceptability and complexity of the intervention, indicating adequate satisfaction of the children with the intervention. The coaches' quality rating on the method as a whole was high. Their ratings indicated that the method may be somewhat more suitable for children aged 8–18 than for younger children, although ratings for the latter group were still above average. All the ratings of the coaches on important attributes of the intervention, such as the fact that the child has to focus on the most difficult detail of the negative event, were high.

Regarding the feasibility, the coaches had a strong motivation to participate in future more in-depth research. The findings indicated that coaches would be most motivated to participate in a larger study with 1–3 follow-up sessions, that focus only on the four emotions as outcome measures, and use 'pen and paper' assessments.

4.1. Limitations and suggestions for future research

The findings of this pilot study should be interpreted in light of its limitations. First, we did not include a control group, and can therefore, not conclude that offering ImRs led to better results than offering no or another intervention. Second, we only assessed the intervention's short-term effects on emotions. Third, we only used a limited set of outcome measures, thereby not taking into account the possible impact of other factors. Fourth, the possibility cannot not be ruled out that only motivated coaches took part, which could result in a positivity bias. To restrict this bias to a minimum, the coach did not play an active role in the child assessments and the coaches' questionnaires were also anonymized. Fifth, as part of the coaching sessions were used for other coaching-elements than ImRs, we only gained first insight in the effect of

ImRs per se. Finally, no diagnostic information of the children was available, making it unable to draw conclusions on the severity of the negative life event and to determine whether children had PTSD.

Future studies on ImRs should be more extensive, and include follow-up assessments, multiple outcome measures, as well as a control group. It would be of interest to follow children who experienced a negative life event over an extended period of time and examine the possible development of trauma related disorders, comparing children's natural courses to children's courses after ImRs. Using multiple baseline assessments eliminates the need for a control group (Hawkins et al., 2007), but the feasibility survey indicated that coaches were not motivated to participate in multiple assessments before and after the coaching session.

5. Conclusion

In a pilot study we examined a one-session intervention based on imagery rescripting in children and adolescents who endured a negative event. We obtained significant improvements for all emotional states immediately after the intervention, with large effects for anxiety, sadness, and happiness, and a moderate effect for anger. Overall, children and adolescents reported fair levels of acceptability and complexity of the intervention. The coaches were positive on all quality ratings of the intervention and supported the feasibility of future research. Altogether, this imagery rescripting based intervention seems a promising venue for children and adolescents who experienced negative events. More in depth-studies are at place to investigate its long-term effects.

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Availability of data

<https://osf.io/zu7ac/>

CRedit authorship contribution statement

Ellin Simon: Conceptualization, Data curation, Formal analysis, Investigation, Methodology, Project administration, Resources, Software, Supervision, Validation, Visualization, Writing – original draft, Writing – review & editing. **Jurian Beeftink:** Investigation, Writing – original draft. **Babelle van 't Hullenaar:** Writing – original draft. **Susan van Hooren:** Supervision, Writing – review & editing.

Declaration of generative AI and AI-assisted technologies in the writing process

During the preparation of this work the author(s) used Chatgpt in order to enhance the use of English. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the publication.

Declaration of competing interest

The corresponding author, dr. Ellin Simon, has no competing interests.

Jurian Beeftink does have competing interests, as he is a coach that provides the tested intervention. However, he was not one of the participating coaches in the study, and he did not have access to the data, nor did he perform any of the analyses.

Babelle van 't Hullenaar has no competing interests.

Susan van Hooren has no competing interests.

Data availability

I have shared the link to my data.

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References

- Aitken, R. C. (1969). Measurement of feelings using visual analogue scales. *Proceedings of the Royal Society of Medicine*, 62, 989.
- Arntz, A., Tiesema, M., & Kindt, M. (2007). Treatment of PTSD: A comparison of imaginal exposure with and without imagery rescripting. *Journal of Behavior Therapy and Experimental Psychiatry*, 38(4), 345–370.
- Arntz, A., & Weertman, A. (1999). Treatment of childhood memories: Theory and practice. *Behaviour Research and Therapy*, 37, 715–740. [https://doi.org/10.1016/S0005-7967\(98\)00173-9](https://doi.org/10.1016/S0005-7967(98)00173-9)
- Benjamin, C. L., O'Neil, K. A., Crawley, S. A., Beidas, R. S., Coles, M., & Kendall, P. C. (2010). Patterns and predictors of subjective units of distress in anxious youth. *Behavioural and Cognitive Psychotherapy*, 38, 497–504.
- Boterhoven de Haan, K., Lee, C., Fassbinder, E., Van Es, S., Menninga, S., Meewisse, M., & Arntz, A. (2020). Imagery rescripting and eye movement desensitisation and reprocessing as treatment for adults with post-traumatic stress disorder from childhood trauma: Randomised clinical trial. *The British Journal of Psychiatry*, 217, 609–615. <https://doi.org/10.1192/bjp.2020.158>
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates, Publishers.
- Davis, J. L., De Arellano, M., Falsetti, S. A., & Resnick, H. S. (2003). Treatment of nightmares related to posttraumatic stress disorder in an adolescent rape victim. *Clinical Case Studies*, 2, 283–294. <https://doi.org/10.1177/1534650103256289>
- De Voogd, Wiers, R. W., & Salemink, E. (2017). Online visual search attentional bias modification for adolescents with heightened anxiety and depressive symptoms: A randomized controlled trial. *Behaviour Research and Therapy*, 92, 57–67.
- Edwards, D. (2007). Restructuring implicational meaning through memory-based imagery: Some historical notes. *Journal of Behavior Therapy and Experimental Psychiatry*, 38, 306e316. <https://doi.org/10.1016/j.jbtep.2007.10.001>
- Faul, F., Erdfelder, E., Lang, A.-G., & Buchner, A. (2007). G*Power 3: A flexible statistical power analysis program for the social, behavioral, and biomedical sciences. *Behavior Research Methods*, 39, 175–191. <https://doi.org/10.3758/BF03193146>
- Fernandez, S., DeMarni Cromer, L., Borntrager, C., Swopes, R., Hanson, R. F., & Davis, J. L. (2013). A case series: Cognitive-behavioral treatment (exposure, relaxation, and rescripting therapy) of trauma-related nightmares experienced by children. *Clinical Case Studies*, 12, 39–59. <https://doi.org/10.1177/1534650112462623>
- Hawkins, N. G., Sanson-Fisher, R. W., Shakeshaft, A., D'Este, C., & Green, L. W. (2007). The multiple baseline design for evaluating population-based research. *American Journal of Preventive Medicine*, 33, 162–168. <https://doi.org/10.1016/j.amepre.2007.03.020>
- Holmes, E. A., Arntz, A., & Smucker, M. R. (2007). Imagery rescripting in cognitive behaviour therapy: Images, treatment techniques and outcomes. *Journal of Behavior Therapy and Experimental Psychiatry*, 38, 297e305. <https://doi.org/10.1016/j.jbtep.2007.10.007>
- Holmes, E. A., Blackwell, S. E., Burnett Heyes, S., Renner, F., & Raes, F. (2016). Mental imagery in depression: Phenomenology, potential mechanisms, and treatment implications. *Annual Review of Clinical Psychology*, 12, 249–280. <https://doi.org/10.1146/annurev-clinpsy-021815-092925>
- Jin, Y., Zeng, P., An, J., & Xu, J. (2019). Negative life events and post-traumatic stress disorder symptoms: A moderated mediation model of only-child status and depressive symptoms. *Public Health*, 172, 31–39. <https://doi.org/10.1016/j.puhe.2019.04.005>
- Kosslyn, S. M. (1994). *Image and brain: The resolution of the imagery debate*. MA: MIT Press.
- Kunze, A. E., Arntz, A., & Kindt, M. (2019). Investigating the effects of imagery rescripting on emotional memory: A series of analogue studies. *Journal of Experimental Psychopathology*, 10, 1–22. <https://doi.org/10.1177/2043808719850733>
- Lau-Zhu, A., Farrington, A., & Bissessar, C. (2022). Boosting exposure and response prevention with imagery-based techniques: a case study tackling sexual obsessions in an adolescent. *The Cognitive Behaviour Therapist*, 15, Article e9.
- Morina, N., Lancee, J., & Arntz, A. (2017). Imagery rescripting as a clinical intervention for aversive memories: A meta-analysis. *Journal of Behavior Therapy and Experimental Psychiatry*, 55, 6–15. <https://doi.org/10.1016/j.jbtep.2016.11.003>
- Morina, N., Leibold, E., & Ehring, T. (2013). Vividness of general mental imagery is associated with the occurrence of intrusive memories. *Journal of Behavior Therapy and Experimental Psychiatry*, 44, 221–226. <https://doi.org/10.1016/j.jbtep.2012.11.004>
- Moritz, S., Hörmann, C. C., Schröder, J., Berger, T., Jacob, G. A., Meyer, B., ... Klein, J. P. (2014). Beyond words: Sensory properties of depressive thoughts. *Cognition and Emotion*, 28(6), 1047–1056.
- Nelius, K., & Ahrens-Eipper, S. (2017). *IRRT mit Kindern und Jugendlichen. Ein Fallbuch mit einer Einführung von Mervyn Schmucker*. Halle: KJP Verlag.
- Patel, V., Flisher, A. J., Hetrick, S., & McGorry, P. (2007). Mental health of young people: A global public-health challenge. *The Lancet*, 369, 1302–1313. [https://doi.org/10.1016/S0140-6736\(07\)60368-7](https://doi.org/10.1016/S0140-6736(07)60368-7)
- Pile, V., Smith, P., & Lau, J. Y. (2021a). Using imagery rescripting as an early intervention for depression in young people. *Frontiers in Psychiatry*, 12, 651115.
- Pile, V., Smith, P., Leamy, M., Oliver, A., Bennett, E., Blackwell, S. E., ... Lau, J. Y. (2021c). A feasibility randomised controlled trial of a brief early intervention for adolescent depression that targets emotional mental images and memory specificity (IMAGINE). *Behaviour Research and Therapy*, 143, Article 103876.
- Pile, V., Smith, P., Leamy, M., Oliver, A., Blackwell, S. E., Meiser-Stedman, R., ... Lau, J. Y. (2021b). Harnessing mental imagery and enhancing memory specificity: Developing a brief early intervention for depressive symptoms in adolescence. *Cognitive Therapy and Research*, 45, 885–901.
- Prerost, F. J. (1984). Evaluating the systematic use of humor in psychotherapy with adolescents. *Journal of Adolescence*, 7(3), 267–276.
- Röhlinger, J., Wulf, F., Fieker, M., & Moritz, S. (2015). Sensory properties of obsessive thoughts in OCD and the relationship to psychopathology. *Psychiatry Research*, 230(2), 592–596. <http://doi.org/10.1016/j.psychres.2015.10.009>
- Sandler, I. N., & Ramsay, T. B. (1980). Dimensional analysis of childrens' stressful life events. *American Journal of Community Psychology*, 8, 285–302. <https://doi.org/10.1007/BF00894343>
- Schwarz, S., Grasmann, D., Schreiber, F., & Stangier, U. (2020). Mental imagery and its relevance for psychopathology and psychological treatment in children and adolescents: A systematic review. *International Journal of Cognitive Therapy*, 13, 303–327. <https://doi.org/10.1007/s41811-020-00092-5>
- Shields, B. J., Palermo, T. M., Powers, J. D., Grewe, S. D., & Smith, G. A. (2003). Predictors of a child's ability to use a visual analogue scale. *Child: Care, Health and Development*, 29, 281–290.
- Waldron, S. M., Maddern, L., & Wynn, A. (2018). Cognitive-behavioural outreach for an adolescent experiencing social anxiety, panic and agoraphobia: A single-case experimental design. *Journal of Child and Adolescent Psychiatric Nursing*, 31(4), 120–126.
- Wewers, M. E., & Lowe, N. K. (1990). A critical review of visual analogue scales in the measurement of clinical phenomena. *Research in Nursing & Health*, 13, 227±236.
- Wolpe, J. (1969). *The practice of behavior therapy*. New York: Pergamon Press.