

# Mechanisms of change in psychotherapy for children and adolescents: current state, clinical implications, and methodological and conceptual recommendations for mediation analysis

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## Introduction

Considerable effort has been made to develop and evaluate psychological treatments in children and adolescents over the last five decades. This resulted in evidence-based treatments for several psychiatric disorders in children and adolescents [1–3] with moderate average effects compared to standard care [4, 5]. Nevertheless, we still have a limited understanding of the mechanisms of change underlying these treatments [6]. Therefore, moving beyond knowing *that* a treatment is effective to explaining *how* its effects occur should become another priority in psychotherapy research in children and adolescents. For example, the beneficial effect of a cognitive–behavioural treatment on depressive symptoms in adolescents may be explained by treatment-induced changes in dysfunctional beliefs [7]. Identifying such mechanisms of change requires the application of mediation analysis to identify the intervening variables (mediators) and processes that account for the association between a specific intervention and the outcome of interest [8].

## Defining and testing mediators in psychotherapy research

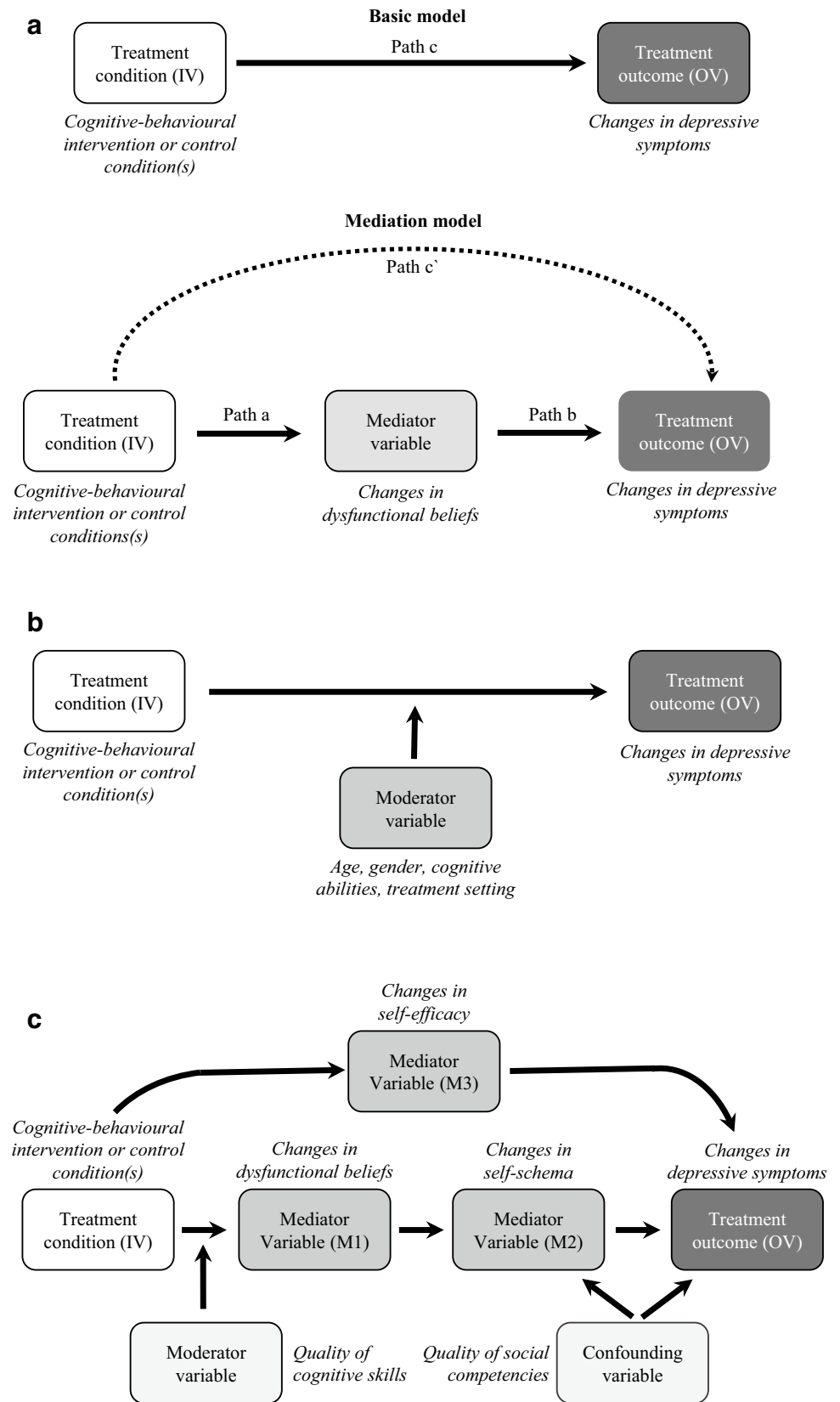
A mediation effect is said to be present if the independent variable (the treatment condition, e.g., a cognitive–behavioural intervention) influences the mediator variable (e.g.,

dysfunctional beliefs), which in turn influences the outcome variable (e.g., changes in depressive symptoms; [7]; see Fig. 1a). Such a mediation effect needs to be distinguished from a moderation effect, i.e., the effect of a third variable (e.g., age, gender, cognitive abilities) that influences the strength of the relationship between two variables (see Fig. 1b). While a moderation effect is able to identify for whom and under what circumstances a treatment produces its effects, a mediation effect helps to clarify how a treatment works [9].

Although methods to test mediation effects have grown in sophistication [10], the most ubiquitous method in the current literature is the ‘causal steps approach’ proposed by Baron and Kenny [11]. According to this approach, two models, a basic model and a mediation model, are used to evaluate mediation effects (see Fig. 1). The basic model postulates a significant association between the independent variable and the outcome variable (path *c*). The mediation model posits a significant association between the mediator and both the independent variable (path *a*) and the outcome variable (path *b*), while the direct relationship between the independent and the outcome variable (path *c*) should no longer be significant (i.e., complete mediation), or at least be substantially reduced (i.e. partial mediation), when the mediator is included in the model (path *c'*). The product of the path coefficients *a* and *b* quantifies the indirect mediated effect of the independent variable on the outcome [8]. However, this approach has been criticized for both its low power and the lack of quantification of the indirect, mediated effect, although the latter is most relevant [12]. Therefore, it is necessary to test the significance level of the indirect, mediated effect (i.e., product of coefficients *a* and *b*) and to estimate its confidence intervals [13]. Additionally, several options are available to calculate effect sizes for the indirect, mediated effect [14]. Consequently, the concept

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**Fig. 1** **a** Basic and mediation model. **b** Moderation model. **c** Sequential, parallel, and moderated mediation model. This is an illustrative example of potential mediator, moderator and confounding variables, and their possible relationships in a complex mediation model. However, this model has not been formally tested yet. *IV* independent variable, *OV* outcome variable



of complete and partial mediation should be abandoned in favour of this procedure because the former is dependent on the sample size and has no theoretical meaning [15]. Performing mediation analyses is a demanding task, raising the question—is it really worth the effort?

### Clinical implications of mediation analyses

Elucidating mechanisms of change could indeed be beneficial for clinical decision-making and treatment development, for the following reasons. Despite the increase in the quantity and quality of evaluation studies [1], available treatments have only proven to be effective to a moderate degree and only for certain subgroups of patients, therapists, and settings [4]. Consequently, these evidence-based treatments should be optimized by identifying active and non-active mechanisms of change. If we do not know how a treatment actually operates, we are at a loss on which therapy components we should focus to produce better therapy outcomes. For example, do we need more cognitive restructuring, catharsis, or family involvement? Following mediation analyses, therapists could enhance the efficacy of treatments by setting the identified mediators into motion or by targeting them more intensively [16].

Furthermore, potential mediators that did not contribute to the efficacy of an intervention or which duplicated other mediators could be discarded from the treatment protocol [17]. Consequently, this could lead to more parsimonious and more potent treatments with fewer but equally effective treatment components, thereby reducing the burden for the patient caused by unnecessary treatment components and limiting resources (e.g., time, costs) [18].

It is likely that the multiple treatments that are already available for specific mental disorders in clinical practice share some mechanisms of change [6]. Mediation analysis has the potential not only to detect effective therapy components of a specific treatment program, but also to aggregate those therapy components that are common to several treatments for a wide range of psychiatric disorders and therapeutic approaches. This is of particular importance because a study has demonstrated that common elements, such as changes in self-efficacy, better explain the effects achieved than specific factors such as cognitive restructuring [19]. This would offer the possibility to develop novel transdiagnostic and potentially brief interventions for a particular problem (e.g., low self-confidence) that are no longer tied to a certain disorder or therapeutic approach, and would help to implement evidence-based treatments into daily practice [20]. Common elements treatments have already been developed (e.g., [21]) based on systematic reviews of treatment components, but not on the basis

of mediation analyses, which is required to infer a causal influence of mediators on therapeutic change.

Mediation analyses may also offer the possibility to personalize a particular treatment by assessing if the relevant mediator(s) already exist(s) within the individual patient, and to what extent these mediators are amenable to change [22]. For example, if cognitive restructuring has proven to be the most important mechanism of change, before beginning an intervention one must confirm that a patient has the required cognitive skills (e.g., mentalising, perspective-taking) to benefit from this intervention technique. Such patient characteristics may thereby act as moderators of the mediation process ('moderated mediation'; [23]) in that they influence who responds or who fails to respond to the mechanism of change (see an illustrative example in Fig. 1c).

### Current status of mediation research in child and adolescent psychotherapy

Mediation studies are rare in child and adolescent psychotherapy. Since the last systematic reviews (e.g., [24]), most studies assessed and identified mediators that refer to aspects of parent–child interactions (e.g., [25]), such as a synchronous communication style, adequate family relationships, family cohesion, parental support, and a positive parental education style. Most of these treatments were designed for (preschool) children and include at least a therapy component for the parents, or were designed as training for parents.

Additionally, other mediators refer to processes within the patient (e.g., [7]) including increases in self-efficacy, motivation, coping, and interpersonal skills. Furthermore, studies have also demonstrated mediation effects of changes in dysfunctional cognitions and negative emotions, as well as in attitudes and perceptions of one's own and peer's behaviour.

Treatment characteristics such as the number of patient–therapist contacts and the overall duration of treatment, as well as the application of specific intervention techniques, such as motivational interviewing, were also found to be effective mediators in preliminary studies (e.g., [26]). Fewer studies have reported inconsistent mediation patterns, or insignificant mediation effects (e.g., [26]) that were mainly associated with therapist characteristics, such as flexibility, treatment adherence, and therapeutic alliance.

Taken together, evidence exists that supports selected mediating relationships. Regrettably, when studies have reported mediation effects, the methodological and conceptual requirements for mediation analyses were often not fulfilled.

## Conceptual and methodological limitations and requirements

Most studies investigated few potential mediators, and assessments primarily relied on one kind of informant (e.g., self-report from the patient or a parent) and one dimension per mediator (e.g., cognitive or behavioural changes). However, multiple putative mediators should be selected as candidates because this allows the relative efficacy of mediators to be determined. Further, mediators should be carefully chosen based on the theoretical framework of the treatment and empirical studies (e.g., [27]) suggesting which variables are most likely to change and where change is supposed to occur [16]. Therefore, the recommended approach is, first, to assess multiple potential mediators within one study. Second, using multiple indicators of a given mediator based on multiple informants (e.g., patient, parents, caregiver) and multiple dimensions per mediator (e.g., cognitive, behavioural, neurobiological) may help to assess a potential mediator in a more valid and reliable way. Third, mediation analysis inherently postulates a causal relationship. However, all statistical approaches to test mediation effects cannot prove causality [12]. Therefore, a randomisation procedure should be applied in evaluation studies to support causal effects of the intervention on both mediators and outcome variables [6, 12]. Next, to assure the required time order of the mediator and the outcome variable, mediators and outcome variables of the model should be assessed simultaneously on at least three different occasions to disentangle cause and effect [6, 28]. For example, a treatment condition may have exerted a direct effect on the outcome variable, which subsequently influenced the mediator variable. Moreover, variables potentially confounding the relationship between treatment, mediator, and outcome should also be measured (see example in Fig. 1c). Notably, reflecting the complexity of the true mechanisms of change, sequential and parallel mediation effects should be distinguished. For example, in Fig. 1c, the mediation effect of dysfunctional beliefs (mediator M1) on changes in depressive symptoms may again be mediated by other potential mediators such as changes in self-schema (M2; sequential mediation). Further, an independent (parallel) mediation effect, e.g., through changes in self-efficacy (M3), may exert an influence on changes in depressive symptoms.

Only recently have researchers begun to develop guidelines and statistical approaches to determine the optimal number and spacing of assessment time points [29]. As many of the mediation studies mentioned above used a pre-post design only, had no control condition, and/or did not assess confounders, we cannot infer causal relationships at all. In the future, several alternative models should also be tested and compared with the assumed mediation model [8].

## Conclusions

In summary, psychotherapy research in children and adolescents has made significant progress with regard to the development of evidence-based interventions. However, clinical decision-making and treatment development is hampered by our lack of understanding of the mechanisms by which change occurs in psychotherapy. The topic of mediation analyses is still at an early stage, but has the potential to optimise the efficacy and the cost-benefit ratio of interventions. Results of mediation analyses may also facilitate the implementation of treatments into clinical practice, by targeting the most powerful mechanisms of change that best fit the individual profile of a patient. As a result, mediators should be routinely assessed in child and adolescent psychotherapy research.

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