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Adolescents in psychodynamic psychotherapy: Changes in internal representations of relationships with parents

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Abstract

This study explored whether and how internal representations of adolescents' relationship with their parents—a fundamental concept in psychodynamic theory—changed in the course of a year of treatment and whether the observed changes were related to changes in symptoms. Seventy two adolescents (ages 15–18; 30 in treatment and 42 in a non-treatment "community group") underwent Relationship Anecdote Paradigm (RAP) interviews according to the Core Conflictual Relationship Theme method (CCRT; Luborsky & Crits-Christoph, 1998) and completed outcome measures at two time points. A novel data-driven approach to clustering CCRT categories was used to characterize internal representations. The potential contribution of this approach to the CCRT method is discussed. The results indicate that adolescents' internal representations of their relationships with their parents changed significantly throughout treatment, and were related to changes in symptoms.

Keywords: adolescent-parent relationships; CCRT; outcome; process; psychodynamic psychotherapy

Introduction

There is a considerable body of research supporting the effectiveness of psychodynamic psychotherapy for adolescents presenting with a range of disorders (see Midgley and Kennedy, 2011, for a recent review). However, relatively few studies have attempted to link specific processes to outcomes. In this article we aim to identify change processes among adolescents undergoing psychodynamic psychotherapy and examine the relationship between these changes and treatment outcome. Specifically, this study investigated a fundamental aspect of the inner world of adolescents, viewed from a psychodynamic perspective—internal representations of the relationship with parents. We explored whether and how these internal representations change throughout treatment, and the relationship between these changes and symptom change.

The theoretical psychodynamic model conceptualizes adolescence as a period of transition in which adolescents work through basic issues of identity (Erikson, 1950), experience of self (Kohut, 1971), social self (Sullivan, 1953), separation-individuation (Blos, 1967), and psycho-sexual development (Freud, 1915). A basic idea in psychodynamic thinking is the process of transformation of internalized parental images from the idealized omnipotent figures of childhood into more realistic flesh and blood figures with a subjectivity that the adolescent struggles to learn to recognize (Benjamin, 1990; Blos, 1967; Winnicott, 1971). This transformation process naturally creates tension in the adolescent-parent relationship. When this tension exceeds tolerable levels, sometimes therapy is needed. In fact, one of the main reasons that prompt adolescents to seek therapy is tensions and conflicts in their relationship with their parents (Boldero & Fallon, 1995; Tishby et al., 2001). Psychodynamic psychotherapy explores the subjective experience of one's interpersonal relationships; i.e., how others are perceived in relation to the self and how the self interacts with others. These subjective experiences of self and other are referred to in the psychodynamic literature as internal representations of relationships (Mitchell & Black, 1995). Internal representations of relationships are based on actual interactions with parents and others; however, because they are internal, they naturally include subjective interpretations of reality and as such tend to contain unrealistic expectations from others, be self-confirmatory and a source of relational tensions, misunderstandings, conflicts, and maladjustment. Psychodynamic psychotherapy aims to help

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adolescents acknowledge their internal representations of relationships with significant others and develop new ways of perceiving and experiencing their relationships. Subsequently, changes in these internal representations are expected to apply to their real-life relationships with parents and others. Although there are studies that have examined changes in adolescent-parent relationships after family or dyadic therapy (e.g., Diamond, Diamond, & Hogue, 2007; Liddle & Schwartz, 2002), there are no studies that we know of that depict changes in internal representations of conflictual relationships with parents over the course of dynamic therapy for adolescents. In the present study we explore whether and how internal representations of adolescents' relationships with their parents changed over the course of a year of psychodynamic treatment and whether the observed changes were related to changes in symptoms.

Research findings show that although most adolescents report positive relationships with their parents, there is an increased level of conflict during this period (De Goede, Branje, Delsing, & Meeus, 2009; Smetana, Campione-Barr, & Metzger, 2006). In addition, researchers agree that moderate conflict levels are part of an adaptive socialization process that promotes adolescent and parental development (e.g., Adams & Laursen, 2007; Dykas, Woodhouse, Ehrlich, & Cassidy, 2010; Smetana et al., 2006), whereas frequent, intense conflicts are relatively more common within the clinical population of adolescents than in non-clinical groups (Steinberg, 2001; Collins & Laursen, 2004). Most previous studies examining adolescent-parent conflicts have focused on *actual* disagreements or incompatible behaviors between the parties (e.g., Adams & Laursen, 2007; Dykas et al., 2010). In the current study we focused on *internal representations* of conflictual relationships of adolescents with their parents. In order to characterize the themes that compose these representations, to examine whether they differentiate a clinical from a non-clinical population, and to compare changes observed in these representations during psychodynamic treatment to changes observed during natural development, we compared a group of adolescents undergoing treatment to a group of adolescents in the community who were equivalent in terms of demographic characteristics but who were not in treatment during the research period. Leading researchers have noted that empirically validating change processes in naturalistic treatments would be a fruitful complement to randomized controlled trials (Ablon, Levy, & Katzenstein, 2006; Bond & Perry, 2004). Accordingly, this study was designed as a naturalistic field study of adolescent psychodynamic therapy.

Although the internal validity in such a design is more limited, it has an advantage in terms of external validity, as it more accurately reflects the reality of clinical work with adolescents in public clinics (Bambery et al., 2007; Morrison, Bradley & Westen, 2003).

Applying the CCRT to Studying Adolescent-Parent Conflict

A natural framework to address these issues is the Core Conflictual Relationship Theme (CCRT; Luborsky & Crits-Christoph, 1998). The CCRT is a well-established method for conceptualizing and assessing clients' repetitive mental representations of interpersonal relationships. The CCRT model views interpersonal patterns as consisting of three basic components: (a) a person's Wishes, needs, or intentions during an interpersonal interaction with a specific other (W); (b) actual or expected Responses of the Other (RO); and (c) expressed or unexpressed Responses of the Self during the interaction (RS). More specifically, concrete W, RO, and RS categories are inferred from narratives (termed Relationship Episodes, or REs) in which patients describe specific interactions with other people. From a psychodynamic perspective, these themes are carried over from a client's painful interpersonal relationships in childhood, and tend to be repetitively applied later in life with different significant others. The repetitive or rigid application of internal representations across and within relationships is considered a hallmark of psychopathology (Barber, Foltz, DeRubeis, & Landis, 2002). The CCRT is one of the most widely used tools to assess change processes in psychodynamic psychotherapy in adults (e.g. Wilczek, Weinryb, Barber, Gustavsson, & Asberg, 2004; Crits-Christoph & Luborsky, 1998). Previous studies have used this method to assess the relationship between internal representations of relationships and symptoms in adult samples (Cierpka et al., 1998; McCarthy, Connolly Gibbons, & Barber, 2008; Wilczek et al., 2004). Although the CCRT method has been modified for use with children (Luborsky & Crits-Christoph, 1998), only a few studies have used it to focus on psychotherapy processes in young people (Agin & Fodor, 1996; Luborsky et al., 1998; Tishby, Raitchick, & Shefler, 2007; Waldinger et al. 2002).

Cluster Analysis of CCRT Categories

The classical approach to analyzing CCRT data relies on a pre-specified partitioning of the CCRT categories associated with each of the three components (W, RO, or RS) into eight clusters per component.

This 24-cluster partitioning was originally proposed by Barber, Crits-Christoph and Luborsky (1998) based on agreement among clinical judges. Thus, it reflects an expert partitioning of the CCRT categories. This partition has been used extensively in studies that have explored a variety of questions and analysis schemes (e.g., De Roten, Drapeau, Stigler, & Despland, 2004; Luborsky, Barber, Schaffler, & Cacciola, 1998; Wilczek et al., 2004). The CCRT system has been expanded and further developed; namely, the CCRT- Leipzig/Ulm (CCRT-LU; Albani et al., 2002) has added more categories, which created richer relational patterns. Another method based on the CCRT is the Quantitative Assessment of Interpersonal Themes (QUAINT; Crits-Christoph, Demorest, Muenz, & Baranackie, 1994). In this method, which is an integration of Luborsky and Crits-Christoph's (1998) core conflictual relationship theme (CCRT) method and Benjamin's (1974) structural analysis of social behavior (SASB), patients' profiles are created based on the most frequent combination of W, ROs and RSs across several relationship episodes.

In the current study we propose a complementary strategy of creating interpersonal patterns from CCRT data. Specifically, we used a well-established cluster-analysis technique (Slonim, Atwal, Tkačik, & Bialek, 2005) to automatically partition the CCRT categories into clusters designed to optimally capture the statistical features of the CCRT data. The first goal of using this strategy was to reduce the number of clusters from 24 to a number of clusters that makes it possible to conduct further statistical analysis. Cluster-analysis provides more freedom in the sense one is not forced to use a pre-specified *number* of clusters, but the cluster resolution can be modified to match the data at hand. When limited data are available, using a relatively small number of clusters can be the only way to extract statistically significant results. Hence there are no a priori limitations on the structure of the clusters generated by the data. In particular, here, the clusters were not restricted to a single CCRT component (such as a Wish cluster or RO cluster), but could consist of any combination of the three components. In this way clusters could be generated that consisted of combinations of W, ROs and RSs; these are referred to henceforth as "*CCRT interactional clusters*".

Another goal of this strategy was to reveal clusters of categories in order to highlight the meaning or the themes that are represented in them. Such clusters make it possible to compare subjects on the same set of interactional patterns. This approach differs from the classical approach to CCRT where an individual CCRT pattern is created for each patient, and only changes within each patient can be examined.

In previous studies subjects were compared on characteristics of their CCRT pattern such as: rigidity/ flexibility (e.g. Wilczek et al., 2004); positive/negative (e.g. Grenyer & Luborsky, 1998) or similarity of interpersonal patterns across an individual's relationships (e.g. McCarthy et al., 2008). The proposed method makes it possible to examine the *content* of the interactional pattern as well.

In summary, this study examined two questions:

1. How do internal representations of adolescent-parent relationships—as reflected by the data-driven assignment of CCRT clusters—change over the course of 1 year in a treatment group compared to a non-treatment community group?
2. To what extent are the changes observed in internal representations of adolescents' relationships with parents related to changes in symptoms and presenting problems?

Method

Participants

Seventy-two adolescents aged 15 to 18 (mean age = 16.3, $SD = .91$) participated in this study, and were divided into two groups: adolescents in treatment (30) and adolescents in the community who were not in treatment (42).

1. Adolescents in treatment. Data for the treatment group were collected from several outpatient clinics in Jerusalem, Israel, that agreed to participate in the study. At intake, the adolescents and their parents were asked whether they were willing to participate in the study. Those who agreed were asked to sign consent forms. Once therapy began, therapists confirmed with their patients that they were willing to be contacted by the research coordinator. From that moment on, the therapists were not involved in the research in any way. Forty-two adolescents who began psychodynamic treatment in these public clinics completed the first interview and questionnaires. Nine adolescents dropped out of treatment shortly after they began, and three adolescents who were in treatment did not appear for the second interview for various reasons (e.g., relocation). A series of *t*-tests and chi-square tests showed no significant relationship between dropout from therapy and demographic variables, initial results of the outcome measures, or initial results of the clusters. Thirty adolescents remained in treatment and completed the second interview. The results of this study are based on the data analysis of these 30 participants. Out of these 30 adolescents 14 turned to psychotherapy of their

own volition and 16 were referred by their parents or by teachers and school counselors. *T*-tests showed no significant differences in outcome measures between adolescents who were referred to treatment and those who sought help on their own initiative. Participants were diagnosed based on the clinical intake and their scores on the Youth-Outcome Questionnaire Self-Report (Y-OQ-SR; Wells, Burlingame, & Rose, 1996). Diagnosis indicated that 88% presented with symptoms of emotional distress such as mild to moderate depression and anxiety, 52% presented somatic distress, 44% had problems in interpersonal relationships and 44% had social problems. Exclusion criteria included adolescents who came in for crisis intervention following severe trauma and adolescents diagnosed as psychotic or drug abusers.

Therapists and therapy. The study began with 42 treatments conducted by 42 different therapists from three different clinics. After the dropouts described above, we were left with 30 adolescents in treatment conducted by 30 therapists. The therapists consisted of 16 clinical psychology interns, 10 licensed clinical psychologists, and four clinical social workers ranging in experience from 2 to 15 years. Interns received weekly individual supervision. The orientation of the staff in these clinics is psychodynamic, based on a blend of Object relations, Self psychology, and Relational theories (Kohut, 1971; Mitchel, 1988; Winnicott, 1971). Treatment was not time-limited by policy but usually lasted about a year and consisted of weekly 45–50-minute sessions. The therapists were not involved in the study in any way, were not familiar with the CCRT method, and were blind to the research questions.

2. Adolescents in the community. The initial no-treatment group was composed of 53 adolescents with demographic characteristics equivalent to those of the treatment group. They were recruited from two large high schools in Jerusalem where the adolescent patients in this sample were studying. The recruitment procedure was as follows: In both schools the school counselor arranged for the research team to visit several classes. The research coordinator described the study and asked for volunteers. The rate of volunteering for this study was very high (95%), and the research team conducted a draw in every class, choosing participants randomly. Three adolescents in this sample began treatment during the year of assessment and therefore were excluded from the study. Eight did not appear for the second interview for various reasons (e.g., moved to a different school). Forty-two

adolescents completed the second interview. The results of the community group are based on the data analysis of these 42 subjects. Table I presents the demographic variables for the sample. In a series of comparisons between the groups on different demographic variables (age, gender, family status, parents' education, birth order and ethnic background) the only significant difference was the higher divorce rate in the treatment group ($\chi^2 = 4.95$; $p < .05$). Due to the small number of participants from divorced families in the sample (13 out of 72) it is beyond the scope of this study to address this finding properly. In addition, no relationships were found between demographic variables and initial levels of outcome measures.

Instruments

Core Conflictual Relationship Theme method (CCRT; Luborsky & Crits-Christoph, 1998). The Relationship Anecdote Paradigm interview (RAP; Luborsky, 1998) was used to collect narratives for the CCRT. In a RAP interview, which is approximately 45 minutes in length, the patient is asked to describe specific episodes in which she or he interacted with another person, by describing what happened, what was said, how she or he reacted, and how the interaction ended. These interviews are transcribed, and the episodes from the interview are

Table I. *N*, means and *SD*s of demographic variables for the treatment and community groups

	Adolescents in treatment $N = 30$	Adolescents in the community $N = 42$
Age		
Mean	15.9	16.2
SD	1.18	.49
Gender		
Male	9	19
Female	21	23
Family status		
Intact	21	38
Divorced	9	4
Mother years of education		
Mean	13.28	14.28
SD	2.83	2.9
Father years of education		
Mean	13.73	13.8
SD	2.83	3.15
Rank in family		
Eldest	12	13
Middle	7	11
Youngest	11	13
A twin		5
Ethnic origin		
Israeli	25	37
European	3	3
American	2	2

regarded as relationship episode units (REs), which are scored according to the CCRT protocol (Luborsky & Crits-Cristoph, 1998). Subjects here were asked to tell three relationship episodes about several significant others (mother, father, peers and the therapist, or another significant adult who was not a family member, for the adolescents in the community group). In this article we only report the REs for the parents. The interviews were conducted by therapists who were trained in the CCRT method prior to the study. All interviews were recorded and transcribed.

Outcome measures

The Youth-Outcome Questionnaire Self-Report
(Y-OQ-SR; Wells et al., 1996). The Y-OQ assesses adolescents' psychological, symptomatic and social functioning. This 64-item self-report questionnaire is composed of six subscales (Intrapersonal Distress, Somatic, Interpersonal Relations, Critical Items, Social Problems, and Behavioral Dysfunction) which tap behavioral domains of children and adolescents experiencing mental health difficulties. The Y-OQ is designed for repeated measurement of clients' emotional and behavioral symptoms (Burlingame, Wells, & Lambert, 1996). The 64 items are summed across the six content areas to produce a total score, where higher scores indicate greater severity of symptoms. The total Y-OQ score demonstrates high internal consistency ($\alpha = .95$) and test-retest reliability (Burlingame, Wells, Lambert, & Cox, 2004). In the current study we used the total score as a measure of severity of psychological distress. The Y-OQ total score correlates highly with other frequently used assessment instruments (Wells et al., 1996); for example, with the Child Behavior Checklist (Achenbach, 1991) ($r = .83$). According to the Y-OQ manual, when certain cutoff scores are reached (46 for the total score of the Y-OQ) the client is said to have reached a normal level distribution of symptoms. The Y-OQ was translated into Hebrew by three clinicians. The translation and back translation were supervised by the first and last authors of this study, guided by instructions from the primary author of the Y-OQ (Lambert, personal communication). The total Y-OQ score of the Hebrew version demonstrated high internal consistency ($\alpha = .94$).

Target Complaints Scale
(TCS; Battle et al., 1966). On this idiographic, widely used outcome measure, clients describe the three main problems that prompted them to go into therapy, listing them in descending order. The severity of each complaint is rated on a scale ranging from 1 ("not at all") to 12 ("couldn't be worse"). Clients are asked to re-rate the same problems at the end of therapy. Mintz and

Kiesler (1981) reported that the TCS demonstrates test-retest reliability ($r = .65$), and that ratings of patients and their therapists on this measure were correlated at different time points in therapy (r ranged from .61 to .71). In the current study adolescents in the treatment group were asked to write and rate the problems that prompted them to go into therapy while adolescents in the community group were asked to write and rate three main problems that were bothering them at the time.

Procedure

Before initiating the study, the researchers submitted all research materials to the regional Helsinki ethics committee (for patients) and to the Ministry of Education (for the community group). Permission to proceed with the study was granted by both committees. The participants were interviewed twice: Once at the beginning of treatment (for the treatment group) or at the beginning of the school year (community group) and then 12 months later.

Time 1. A week after the beginning of treatment the initial Y-OQ and TCS were administered to the adolescents by the research coordinator. The initial RAP interviews were conducted for the participants in the treatment group 4–5 weeks after beginning therapy. Based on findings by Barber, Luborsky, Crits-Cristoph and Diguer (1995), at this point in time the therapeutic relationship is presumed to have begun to develop, though changes in CCRTs are not yet expected to occur. The same questionnaires and interviews were administered to adolescents in the community, in a one-session meeting, at the beginning of the school year. There was a 4–5-week difference between the administration of the outcome questionnaires and the RAP interviews within the treatment group whereas within the community group both questionnaires and interview were administered in the same session. The order of administration was the same and the interval between the first and the second completion of the outcome measures was identical for both groups. Before starting the interview participants were told that this was a study about relationships in adolescence, and that they would be interviewed again within a year. Participants from the treatment group were asked to narrate three short relationship episodes about parents, peers and their therapist. Adolescents in the community group were asked to tell about a significant adult who was not a family member, instead of the therapist. The interviewers were instructed not to interfere with the flow of the narrative, but to ask for clarifications and details if the RE was a bit brief or vague.

Time 2. Twelve months after completing the initial data collection participants from both groups were invited for a second meeting in which they were administered the Y-OQ, TCS and the RAP interview. All questionnaires and interviews were conducted identically to Time 1. Participants in both groups were paid 30 NIS (about $8.00) for each interview as a token of appreciation for their time and their willingness to cooperate.

Rating the CCRT. The RAP interviews were audiotaped, transcribed, and given to one of the three CCRT judges: a senior clinical psychologist, a clinical psychology graduate student or a social work graduate student. All the judges were given extensive training in the CCRT rating method as described in Luborsky and Crits-Cristoph (1998). The judges were asked to read each relationship episode and rate the extent to which each category was present on a scale of 1 (the category is not present) to 7 (the category is mostly present in the episode). Specifically, the judges used the standard category list in Luborsky and Crits-Cristoph (1998), which contains a total of 117 categories: 39 Ws, 36 ROs and 42 RSs. The judges were blind to the participants' group status (treatment/community), the time of the interview and the research hypotheses. To estimate inter-rater agreement, 20% of the REs were rated by two randomly assigned judges out of the three, in a balanced incomplete block design (Fleiss, 1981). Inter-rater reliability was determined by calculating intraclass correlations (ICC [2 k]; Shrout & Fleiss, 1979), where "judge" was considered a random effect, and k was the number of judges ($k = 2$ in the current study). Thus, the ICC estimates in the current study refer to the reliability of the aggregated score from two judges' ratings. The average ICC [2,2] was .90 for Ws, .90 for ROs and .87 for the RSs. In addition, in the same REs both assigned judges provided a constant rating of 1 for 12 categories. These 12 categories appeared to be less relevant to the adolescent-parent relationship (e.g. the Wish "to be sexual" and the RO "is sexually attracted to me"). Thus, they were removed from the following analysis, which focused on the remaining 105 CCRT categories.

Data-driven clustering of CCRT categories

Unlike the classical approach to analyzing CCRT data where the most dominant categories are determined for each component independently, a data-driven approach that can yield clusters of CCRT categories from different CCRT components was applied. This may highlight dominant patterns of *interaction* between self and other. Furthermore, this

approach enables greater flexibility in the analysis as it allows researchers to determine the appropriate number of clusters to be used, rather than being constrained to a pre-specified partition into 24 clusters. A clustering procedure typically relies on the definition of a similarity measure. Here, we defined the pair-wise similarity between each pair of categories via the Pearson correlation (PC) between the data associated with the two categories to obtain a (symmetric) pair-wise similarity matrix of 105 rows and 105 columns in which the (i,j) entry indicates the PC between the i-th CCRT category and the j-th CCRT category. More specifically, the data for each category were represented as a vector comprising the entire RAP scores reported for this category across all study participants. In particular, for each participant, 12 relationship episodes were taken into account: three for the mother and three for the father, at Time 1 and Time 2, respectively. Since we had a total of 72 participants in the study, the data vector representing each category consisted of 864 (72×12) RAP scores, ranging from 1 to 7. In this grid, the PC between each pair of CCRT categories can be estimated directly. This procedure involved three non-trivial decisions. First, the data considered for estimating the PC relations were collected from all 72 study participants. A valid alternative would have been to consider only data collected from the 30 adolescents in treatment. The correlation between the 105^2 PC relations obtained in both alternatives was .91 (the associated p-value is effectively zero). Hence, the clustering results obtained for both alternatives were very similar, and for conciseness we report the results for the total sample. Second, the data considered for estimating the PC relations included the data collected for both mother and father. In earlier stages of this work we tried to generate clusters using RAPs of fathers and RAPs of mothers independently. The obtained clusters were highly similar to the clusters obtained when considering jointly the data associated with both parents. Hence, to simplify the presentation we present here only these joint results. Further research with larger datasets is needed to examine the differences between clusters generated for each parent separately. Third, the data considered for estimating the PC relations included the data collected at Time 1 and Time 2. This decision was motivated by the fact that our main interest was the dynamics of the CCRT RAP scores between the two time points. In this context, when estimating the PC between two CCRT categories it seemed reasonable to consider the data collected at both time points.

The literature on clustering is vast, and numerous techniques have been proposed (see Jain, 2010, for a recent review). In principle, any well-established

clustering technique could have been employed within our framework. Here, we decided to use the recent Iclust sequential algorithm that has been successfully applied in many different domains (Slonim et al., 2005; Yom-Tov & Slonim, 2009). In our context, the algorithm starts from a random partition of the CCRT categories into K clusters, where K is pre-specified. Then, the algorithm selects at random one CCRT category, pulls it out of its current cluster and re-assigns it to one of the K clusters such that the underlying Iclust cost function is maximized. In particular, in our case, this cost function measures the average pair-wise PC between categories assigned to the same cluster. This process is repeated sequentially until no more improvements are possible; namely, the algorithm converges to a stable partition, formally referred to as a locally optimal partition. The entire procedure is repeated N times, and the partition that obtains the highest score in terms of the Iclust cost function is reported as the result of the algorithm.[1] Importantly, the entire process is completely automatic, and the user merely needs to determine the number of clusters, K, and the number of independent runs, N. The latter parameter, N, has relatively little impact on the results, since a larger N simply typically ensures that the obtained partition is of relatively high quality. Specifically, here we used $N = 100$. The number of clusters, K, is obviously of greater importance as described in the next section.

Comparative Cluster Resolution

There is a vast literature on how to automatically determine the number of clusters (for a review see Tibshirani, Walther, & Hastie, 2001). In the current work two different cluster resolutions were examined. The first grouped the 105 CCRT categories into $K = 3$ clusters. $K = 3$ was arbitrarily selected to examine the flexibility of the method in extracting clusters at different resolutions. The second grouped the 105 CCRT categories into $K = 10$ clusters, which is the default K value selected by the Iclust algorithm implementation. Henceforth, we refer to these two partitions as the high-level partition and the detailed partition, respectively. As discussed below, in both cases the completely automatic clustering procedure revealed surprisingly meaningful clusters. In Table II we outline the high-level partition. The left column indicates the cluster index, along with a title chosen to reflect the common theme of the categories assigned to this cluster. The next column indicates the CCRT category name and the CCRT component to which it is associated—W, RO, or RS. In addition, for each category we indicate its typicality in its cluster, formally defined as the average PC of

Table II. The clusters obtained for the high-level partition, $K = 3$

Cluster title	CCRT category included	Typicality
"Close and supportive interaction"	RS – Like others	0.21
	RO – Other likes me	0.19
	RS – Being helped	0.19
	RO – Other enables	0.18
	RS – Feel happy	0.18
	RO – Other helps me	0.17
	W – To be close	0.17
	RS – Respect others	0.17
	RS – Feel Loved	0.17
	RS – Am open	0.16
	RO – Other is strong	0.15
	RS – Feel comfortable	0.15
	RO – Other is caring	0.15
	RS – Feel respected	0.13
	RO – Other is happy	0.13
	RO – Other understands	0.13
	RS – Feel accepted	0.13
	W – To be helped	0.12
	RO – Other cooperate	0.12
	RO – Respects me	0.11
	RS – Self confident	0.11
	W – To be open	0.11
	RO – Other is open	0.11
	RO – Other accepts me	0.10
	W – To be like the other	0.10
	W – To feel good	0.10
	RS – Am dependent	0.10
	W – To be taken care of	0.10
	W – To be liked	0.09
	W – To be happy	0.08
	RS – Understand	0.08
	W – To respect others	0.08
	W – To be opened up to	0.08
	RO – Gives me independence	0.06
	W – To feel good	0.06
	W – To achieve	0.06
"Emotionally painful interaction"	RO – Other is limited	0.13
	RS –Depressed	0.12
	W – Not to be hurt	0.11
	RS – Don't like other	0.11
	RO – Other doesn't like me	0.11
	RO – Other is bad	0.11
	RO – Other hurts me	0.11
	W – Other will be better	0.11
	RO – Other is out of control	0.10
	RO – Other is not trustworthy	0.10
	RS – Am not open	0.10
	RO – Other is dependent	0.10
	W – Not to be abandoned	0.10
	W – Not to hurt others	0.10
	RS – Feel unloved	0.09
	RS – Feel hurt	0.09
	RS – Self controlled	0.09
	W – To have stability	0.09
	RO – Other is hurt	0.09
	RS – Disappointed	0.09
	W – To be distant	0.08
	RO – Other is distant	0.08
	RS – Ambivalent	0.08
	RS – Feel guilty	0.08
	RS – Avoid conflict	0.08
	RS – Hurt others	0.07
	W – To avoid conflict	0.07

Table II (*Continued*)

Cluster title	CCRT category included	Typicality
	RS – Feel helpless	0.06
	RO – Other is invasive	0.06
	RS – Feel indifferent	0.06
	RO – Other is anxious	0.05
	W – To accept other	0.05
	RS – Am out of control	0.04
	RS – Don't understand	0.04
	W – To help other	0.04
	W – To be good	0.04
	RS – Physiological symptoms	0.04
	RS – Accept other	0.04
	RS – Help other	0.04
	RS – Feel ashamed	0.03
	W – To be controlled	0.03
	RS – Feel anxious	0.03
"Struggle for autonomy"	RO – Other doesn't understand	0.25
	RS – Feel not understood	0.24
	RS – Feel angry	0.24
	RO – Other is critical	0.23
	RS – Oppose others	0.22
	RO – Other is angry	0.20
	RO – Other is controlling	0.20
	RO – Other oppose me	0.19
	RS – Feel not accepted	0.17
	RO – Other is strict	0.17
	RO – Other doesn't count on me	0.16
	W – To be understood	0.16
	RO – Other doesn't respect me	0.16
	W – To oppose	0.15
	RS – Controlling	0.15
	W – Not to be forced	0.13
	W – To be accepted	0.13
	W – To control others	0.13
	W – To be trusted	0.12
	W – To be respected	0.12
	W – To be independent	0.12
	RO – other is unhelpful	0.12
	W – to be my own person	0.12
	RS – independent	0.11

Note. Typicality refers to the average Pearson coefficient correlation of the category with all the other categories in the cluster. W = Wish, RO = Response of Other, RS = Response of Self.

the category in terms of all other categories assigned to the same cluster. As indicated in this table, the first cluster consisted of categories mainly associated with "Close and supportive interactions." The second cluster consisted of categories that mainly represented "Emotionally painful interactions." Finally, the third cluster consisted of categories associated with adolescent-parent conflicts on issues of individuation and autonomy referred to as the "Struggle for autonomy" cluster.

In Table III we present the detailed partition, with $K = 10$ clusters, after discarding the lowest quality cluster, identified as the cluster with the lowest average intra-cluster PC. The first three columns are as in Table II, where again each cluster was

Table III. The clusters obtained for the detailed partition with $K = 10$, and comparison with $K = 3$

Cluster title	CCRT categories included	Typicality	Category assignment in the $K = 3$ partition
In a happy relationship	RS – Like others	0.43	Close and supportive
	RO – Other likes me	0.42	Close and supportive
	W – To be close	0.41	Close and supportive
	RS – Feel happy	0.38	Close and supportive
	RO – Other is happy	0.34	Close and supportive
	RS – Feel loved	0.29	Close and supportive
	RO – Other is open	0.28	Close and supportive
	W – To be happy	0.28	Close and supportive
	W – To be opened up to	0.23	Close and supportive
	W – To be like other	0.22	Close and supportive
To be cared for	RS – Being helped	0.51	Close and supportive
	RO – Other helps me	0.51	Close and supportive
	W – To be helped	0.51	Close and supportive
	RO – Other is caring	0.51	Close and supportive
	RO – Other is strong	0.51	Close and supportive
	RS – Respect others	0.51	Close and supportive
	RS – Am dependent	0.51	Close and supportive
	W – To be taken care of	0.51	Close and supportive
Helpful and respected	RO – Other respects me	0.49	Close and supportive
	RS – Feel respected	0.47	Close and supportive
	RS – Self confident	0.39	Close and supportive
	RS – Help Other	0.39	Emotionally painful
	W – To help	0.38	Emotionally painful
	W – To be respected	0.36	Struggle for autonomy
In an accepting relationship	RS – Am open	0.38	Close and supportive
	RO – Other enables	0.37	Close and supportive
	RS – Feel accepted	0.36	Close and supportive
	RO – Other accepts me	0.35	Close and supportive
	RO – Other understands	0.33	Close and supportive

Table III (*Continued*)

Cluster title	CCRT categories included	Typicality	Category assignment in the $K=3$ partition
	W – To be open	0.31	Close and supportive
	RS – Feel comfortable	0.29	Close and supportive
	RO – Other cooperates	0.23	Close and supportive
Abandoned	W – Not to be abandoned	0.41	Emotionally painful
	RO – Other doesn't like me	0.40	Emotionally painful
	RS – Feel hurt	0.38	Emotionally painful
	RS – Feel unloved	0.37	Emotionally painful
	RS – Other hurts me	0.35	Emotionally painful
	W – Not to be hurt	0.31	Emotionally painful
	RS – Disappointed	0.30	Emotionally painful
	RO – Other is bad	0.30	Emotionally painful
	RO – Other is distant	0.28	Emotionally painful
	W – To be liked	0.27	Emotionally painful
	RO – Other is not trustworthy	0.27	Emotionally painful
To hurt	W – Other will be better	0.36	Emotionally painful
	RO – Other is limited	0.36	Emotionally painful
	RO – Other is out of control	0.35	Emotionally painful
	RO – Other is hurt	0.33	Emotionally painful
	RS – Hurt others	0.30	Emotionally painful
	RS – Am out of control	0.25	Emotionally painful
Withdraw from invasive parent	RS – Am not open	0.27	Emotionally painful
	W – To be distant	0.27	Emotionally painful
	W – Not to hurt others	0.23	Emotionally painful
	RO – Other is invasive	0.22	Emotionally painful
	RS – Avoid conflict	0.22	Emotionally painful
	RO – Other is dependent	0.22	Emotionally painful
	RS – Don't like others	0.21	Emotionally painful
	RS – Self controlled	0.21	Emotionally painful
	W – To avoid conflict	0.21	Emotionally painful

Table III (*Continued*)

Cluster title	CCRT categories included	Typicality	Category assignment in the $K=3$ partition
	RS – Depressed	0.21	Emotionally painful
	RS – Feel guilty	0.21	Emotionally painful
	RS – Feel indifferent	0.15	Emotionally painful
Angry and misunderstood	RO – Other doesn't understand	0.41	Struggle for autonomy
	RS – Feel not understood	0.39	Struggle for autonomy
	RO – Other is critical	0.38	Struggle for autonomy
	RS – Feel angry	0.33	Struggle for autonomy
	W – To be understood	0.31	Struggle for autonomy
	RO – Other is angry	0.31	Struggle for autonomy
	RS – Feel not accepted	0.29	Struggle for autonomy
	W – To be accepted	0.26	Struggle for autonomy
	RO – Other doesn't respect me	0.25	Struggle for autonomy
	RO – Other is unhelpful	0.23	Struggle for autonomy
Strive for independence	RS – Oppose others	0.26	Struggle for autonomy
	RO – Other is controlling	0.25	Struggle for autonomy
	RO – Other opposing me	0.25	Struggle for autonomy
	W – To be independent	0.22	Struggle for autonomy
	RO – Doesn't count on me	0.22	Struggle for autonomy
	W – To control others	0.20	Struggle for autonomy
	W – To oppose	0.20	Struggle for autonomy
	RS – Controlling	0.20	Struggle for autonomy
	W – Not to be forced	0.20	Struggle for autonomy
	RO – Other is strict	0.20	Struggle for autonomy
	RS – Independent	0.17	Struggle for autonomy
	RO – Other is anxious	0.16	Emotionally painful
	W – To be trusted	0.16	Struggle for autonomy

Note. The lowest-quality cluster was discarded; typicality refers to the average Pearson coefficient correlation of the category with all the other categories in the cluster; W = Wish, RO = Response of Other, RS = Response of Self.

asssigned a concise label. In the right-hand column of Table III we indicate the cluster to which this category was assigned in the high-level partition. Although both partitions were obtained by independent executions of the clustering procedure with $K=3$ and $K=10$, respectively, the results were consistent, supporting the reliability of the obtained clusters. Finally, in Figure 1 we depict the pair-wise PC relations of all 105^2 category pairs in which categories were sorted according to the detailed partition; i.e., as in Table III. This figure further visualizes the statistical structure of the data. Specifically, the (intra-cluster) PC relations between pairs of categories assigned to the same cluster were relatively high compared to the PC relations between categories assigned to different clusters. In addition, the (inter-cluster) PC relations between categories assigned to different clusters were relatively high if the clusters were thematically related (see, e.g., the inter-cluster PC relations between the first cluster— "In a happy relationship,", and the fourth cluster— "In an accepting relationship"), and relatively low and even below zero if the two clusters had very different themes (see, e.g., the inter-cluster PC relations between the first cluster—"In a happy relationship", and the eighth cluster—"Angry and misunderstood").

Results

Research Question 1: Changes in the Clusters over Time

Cluster scores were obtained by calculating the mean of all categories included in the cluster at each time point. First we examined whether the clinical group differed from the non-clinical group in the three clusters in the high level partition at Time 1. Independent sample *t*-tests indicated a significant difference between the treatment and the community group in the clusters "Close and Supportive interaction" and in the cluster "Emotionally Painful interaction" ($t_{(70)}=2.4$, $p<.05$; $t_{(70)}=2.4$, $p<.05$, respectively). No significant difference was found in the third high-level cluster. To examine changes over time in the treatment group compared to the community group, we continued focusing on the three clusters in the high-level partition. We conducted a repeated measures Analysis of Variance (ANOVA) with each of the three mean cluster scores at the two time points as the within-subject variables, and group (treatment/community) as the between-subject variable.

Table IV details the mean scores and associated SD for the clusters, for both groups, at each time point. The first three rows of Table IV show the scores of the three high-level clusters. The ANOVA
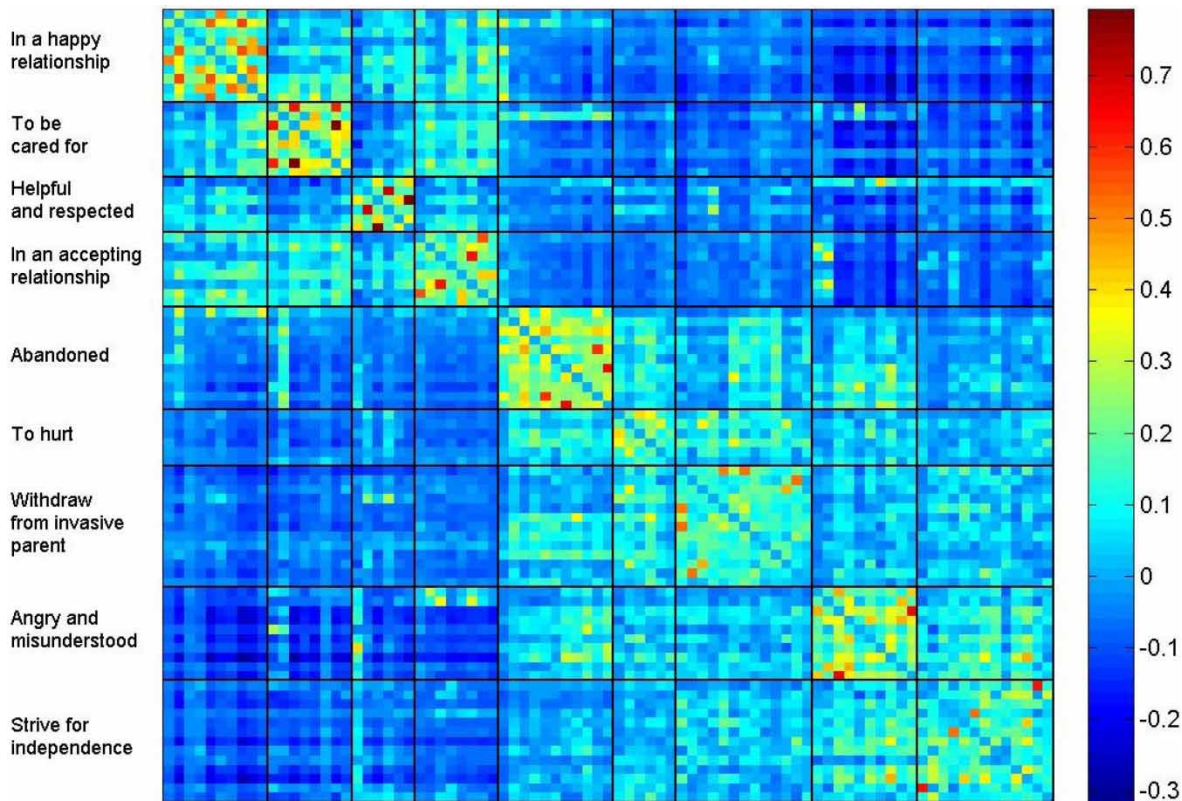

Figure 1. Sorted pairwise correlation matrix for the detailed partition.

Table IV. Descriptive statistics for the clusters in the high- and detailed-level partitions at the two time points for both groups

| | Group | Treatment | | | | Community | | | |
| | Time | Time 1 | | Time 2 | | Time 1 | | Time 2 | |
Partition	Cluster	M	SD	M	SD	M	SD	M	SD
High level	Close and supportive	2.10	0.60	2.50	0.79	2.50	0.64	2.49	0.80
	Emotionally painful	1.95	0.64	1.81	0.47	1.60	0.45	1.57	0.41
	Struggle for autonomy	2.41	0.54	2.80	0.76	2.39	0.84	2.49	0.88
Detailed level	In a happy relationship	2.69	1.20	2.93	1.22	2.94	1.08	2.8	1.42
	To be cared for	2.54	1.07	2.73	1.41	3.09	1.33	2.99	1.27
	Helpful and respected	2.15	.84	2.6	1.29	2.6	1.12	2.7	1.31
	In an accepting relationship	2.0	1.04	2.73	1.43	2.3	1.06	2.3	1.01
	Abandoned	1.96	.89	1.6	.50	1.45	.62	1.45	.61
	To hurt	2.01	1.02	2.00	.81	1.5	.59	1.5	.62
	Withdraw from invasive parent	2.2	1.09	2.0	.9	1.8	.67	1.74	.75
	Angry and misunderstood	3.01	1.09	3.39	1.07	2.68	1.04	2.81	1.24
	Strive for independence	2.0	.55	2.32	.86	2.10	1.06	2.2	1.01

for the "Close & supportive interaction" cluster yielded a significant time × group interaction effect ($F_{(1,70)} = 5.29$, $p < 0.05$, Partial $\eta^2 = .07$, 95% CI [0, .20]), indicating that the treatment group increased in that cluster ($F_{(3,68)} = 7.17$, $p < .001$, Partial $\eta^2 = .24$, 95% CI [.06, .37]) whereas the community group did not change. No main effects were found for this cluster. The ANOVA for the "Emotionally painful interaction" cluster yielded a main group effect ($F_{(1,70)} = 6.78$, $p < .01$, Partial $\eta^2 = .09$, 95% CI [0, .23]) indicating that the treatment group had significantly higher scores within this cluster compared to the community group. The ANOVA for the "Struggle for autonomy" cluster yielded a significant main time effect ($F_{(1,70)} = 5.08$, $p < .05$, Partial $\eta^2 = .07$, 95% CI [0, .20]), indicating that the scores of both groups within this cluster increased significantly over time. Effect sizes tended to be low.

The detailed partition represented a more fine-grained resolution of the high-level partition, and captured more subtle aspects of the adolescents' relationship patterns with their parents. Specifically, each of the high-level clusters was naturally associated with more specific clusters in the detailed partition. Thus, we found it useful to explore the contribution of each of the clusters in the detailed partition to the ANOVA results reported above for the high-level partition. To that end, we repeated the same analysis for all nine clusters in the detailed partition, and found some clear trends. The nine lower rows of Table IV depict the cluster scores of the detailed partition. ANOVA results for the cluster "In an accepting relationship" (associated with the higher-level "Close & supportive interaction" cluster) yielded a time × group interaction effect ($F_{(1,70)} = 4.01$, $p < .05$, Partial $\eta^2 = .06$, 95% CI [0, .18]) indicating that the treatment group

increased in that cluster ($F_{(1,70)} = 8.58$, $p < .01$, Partial $\eta^2 = .11$, 95% CI [.01, .25]) whereas the community group did not change. In the cluster "Abandoned" (associated with the high-level "Emotionally painful interaction" cluster) we found a time × group interaction effect ($F_{(1,70)} = 5.62$, $p < .05$, Partial $\eta^2 = .07$, 95% CI [0, .21]) indicating that the treatment group scores decreased ($F_{(1,70)} = 3.7$, $p = .05$, Partial $\eta^2 = .05$, 95% CI [0, .17]) in that cluster whereas the community group scores did not change. Finally, in the cluster "To hurt" (associated with the high-level "Emotionally painful interaction" cluster) and in the cluster "Angry and misunderstood" (associated with the high-level "Struggle for autonomy" cluster) we observed main group effects ($F_{(1,70)} = 9.96$, $p < .01$, Partial $\eta^2 = .12$, 95% CI [.02, .27]; $F_{(1,70)} = 4.71$, $p < .05$, Partial $\eta^2 = .06$, 95% CI [0, .19], respectively) indicating that the treatment group scores for these two clusters were higher than the community group scores. No significant effects were found for the other clusters.

Research Question 2: The Relationship between Changes in Clusters and Changes in Outcome

In a previous study that examined the same data (Atzil Slonim, Shefler, Dvir Gvirsman, & Tishby, 2011), it was found that the treatment group improved in both outcome measures (Y-OQ-SR and TCS) significantly more than the community group. Descriptive statistics for the scores in the outcome measures at the two time points are presented in Table V.

In the current study we first examined whether the initial scores in the high-level clusters were related to initial levels of the outcome measures. To do so, PC coefficients were calculated between the three high-level cluster mean scores at Time 1 and

Table V. Means and *SD*s of outcome measures scores (Y-OQ and TCS) at two time points, for the treatment and community groups

Outcome measure	Y-OQ		TCS	
Time	Time 1	Time 2	Time 1	Time 2
Adolescents in treatment	74.33	58.73	9.46	4.35
N = 30	(23.86)	(28.75)	(1.62)	(2.42)
Adolescents in the community	37.59	30.90	8.26	5.99
N = 42	(24.47)	(21.60)	(2.13)	(2.49)

Note. Y-OQ = Youth Outcome Questionnaire; TCS = Target Complaint Scale. According to the Y-OQ manual a decrease of 13 points or more is a significant amount of symptom reduction (Y-OQ; Burlingame et al., 1996).

each of the outcome measure scores at Time 1. These correlations were calculated using all study participants (treatment and community) as the sample, in order to validate the clusters. The initial level of the "Close & supportive interaction" cluster was negatively correlated with the initial level of the Y-OQ-SR ($r = .30$, $p = .01$). The initial level of the "Emotionally painful interaction" cluster was positively correlated with the initial level of the Y-OQ-SR ($r = .26$, $p < .05$). No significant correlations were found between the "Struggle for autonomy" cluster and the outcome measures or between the initial cluster scores and the TCS.

Next, we examined the relationship between **changes** in the cluster scores and **changes** in both outcome measures, using adjusted (residual) gain scores (residual gain scores are the result of a multiple regression analysis that defines the post score of the outcome as the dependent variable and the pre score as the predictor). The purpose of this method was to allow for an assessment of change corrected for the initial level observed for each measure. Thus, PC values were calculated between changes in each of the high-level cluster mean scores and changes in each of the outcome measures. Change was expected only in the treatment group, and thus the correlations were calculated separately by group when concerning change and symptom scales.

Within the treatment group, changes in the "Struggle for autonomy" cluster were positively correlated with changes in the TCS ($r = .50$, $p < .01$), suggesting that the increase in the scores reported for this cluster was related to an increase in the reported complaints and vice versa. In addition, changes in the "Emotionally painful interaction" cluster were negatively correlated with changes in the Y-OQ-SR ($r = .35$, $p = .05$), suggesting that the increase through treatment in the scores reported for this cluster was related to the decrease in the reported symptoms.

Discussion

In order to demonstrate dynamic changes over the course of psychotherapy with adolescents, we first characterized the internal representations of adolescent-parent relationships, which constitute a central concept in theoretical psychodynamic model. We then examined the baseline levels of these representations and their association with initial levels of symptoms in adolescents starting treatment compared to adolescents in the community. The data-driven approach to analyzing adolescents' CCRT data revealed coherent clusters that corresponded to key internal representations of adolescents' relationships with their parents described in the literature (e.g., Collins & Laursen, 2004). Two of the three high-level clusters clearly distinguished the clinical population from the non-clinical population. Specifically, the treatment group was characterized by higher initial levels of the "Emotionally painful interaction" cluster and lower initial levels of the "Close and supportive interaction" cluster, compared to the community group. In addition, significant correlations were found between the initial level of symptoms and initial mean scores on these two clusters. In particular, ratings for the "Emotionally painful interaction" cluster were positively correlated with YOQ scores, whereas ratings for the "Close and supportive interaction" cluster were negatively correlated with YOQ scores. The above findings further support the validity of the automatically extracted clusters. Additionally, these findings are consistent with current research indicating that adolescents who are not in the clinical range tend to view their relationship with their parents as positive (Allen, 2008; Offer, Howard, Schonert, & Ostrov, 1991) and that supportive relationships with parents are associated with adolescents' well-being (Seiffge-Krenke, 2011; Way & Robinson, 2003). Furthermore, the higher scores observed in the treatment group for the "Emotionally painful interaction" cluster and the correlation between mean cluster scores and level of symptomatology are in line with studies showing that high percieved negativity of the relationship with parents and unsupportive parenting are among the factors differentiating a clinincal population from a community population (Adams & Laursen, 2007; Steinberg, 2001). According to a recent review of relationship stressors in adolescence (Seiffge-Krenke, 2011) unsupportive parenting has the strongest and most enduring impact on coping and the mental health of adolescents. While most previous studies examining adolescent-parent conflicts have focused on *actual* disagreements or incompatible behaviors between the parties (e.g., Adams & Laursen, 2007; Dykas et al., 2010),

the current study suggests that *internal representations* of these relationships also differentiate clinical from non-clinical populations.

The scores obtained for the third high-level ("Struggle for autonomy") cluster did not differentiate between the groups, and these scores were not associated with initial levels of symptoms. The categories included in this cluster seem to be related to a struggle for independence and autonomy, which is described in the literature as a normative developmental process (Blos, 1967). Thus, the three high-level clusters appear to reflect three general and highly distinct patterns of adolescents' internal representations of relationships with their parents.

In order to study representations of interpersonal patterns in greater depth we further applied our method to extract a more fine-grained clustering partition of the CCRT categories. The nine clusters obtained in this detailed partition indeed seem to depict more specific interactions. Interestingly, although the high-level partition and the detailed partition were obtained independently, both were almost perfectly consistent (Table III). For example, the high-level "Emotionally painful interaction" cluster was decoupled in the detailed partition into more subtle patterns, such as "Abandoned" and "Withdrawing from invasive parent." The first presumably represents interactions with a neglecting parent, whereas the second presumably represents adolescents' attempts to distance themselves from parents intruding on their boundaries.

After identifying the characteristic internal representations of adolescents' relationships with their parents we examined whether and how the extent in which these representations are experienced during psychodynamic treatment compared to changes observed for non-clinical adolescents through their normal development. Our findings showed that the scores observed for the "Close and Supportive" cluster increased over time in the treatment group, whereas for the community group no significant corresponding change was detected. For the "Emotionally painful interaction" cluster, we observed no significant changes over time in either group. However, the scores observed in the treatment group, across both time points, were significantly higher than those observed in the community group. Jointly, these findings may indicate that while adolescents did not replace their negative perceptions with positive ones, they added more positive perceptions to their repertoire through treatment. These findings are in line with contemporary psychodynamic perspectives that highlight the importance of sustaining negative emotions while developing more options to experience self and other through treatment (Mitchell, 1993). According to psychodynamic

theory, when normal developmental processes are disrupted, internal representations of relationships become more narrow and rigid. Psychodynamic psychotherapy aims to facilitate change by working through these rigid representations so that adolescents can develop a wider variety of options for experiencing their parents and relating to them. In a previous study (Atzil Slonim et al., 2011) the authors found an increase in flexibility of internal representations of relationships through therapy as manifested in a broader range of emotions and perceptions at the end of treatment. In the current study, we identified the specific themes that developed through treatment composing this broader range. For the third high-level "Struggle for autonomy" cluster, we observed increased ratings over time in both groups. This result is congruent with research findings reporting increasing levels of stress and conflicts in middle adolescence as a normal developmental process (De Goede et al. 2009; Smetana et al., 2006).

In order to highlight more specific trends in our data related to changes over time in specific internal representations of relationships, we repeated the same analysis for each of the nine clusters in the detailed partition. In spite of the relatively small study population, our results in this context seem to indicate several potentially interesting trends. Specifically, the scores reported for the treatment group as compared to the community group increased over time for the cluster "In an accepting relationship," and decreased over time for the "Abandoned" cluster. In addition, the treatment group scores remained higher compared to the community group in the "To hurt" cluster and in the "Angry and misunderstood" cluster. Adams and Laursen (2007) pointed out that conflicts with parents can be constructive only in supportive relationships. A possible interpretation of the above findings is that throughout the first year of treatment, there was an increase in the adolescents' sense of security in their relationship with their parents (they became more accepted and less abandoned), which may have allowed them to continue working through their negative internal representations in a more constructive way.

The positive correlation between changes in the "Struggle for autonomy" high-level cluster and changes in the TCS within the treatment group is not surprising. It suggests that changes in the intensity of conflicts related to autonomy and formation of identity go hand in hand with the intensity of subjective complaints. The negative correlation between changes in the "Emotionally painful interaction" high-level cluster and changes in the YOQ scores within the treatment group is more intriguing. A possible explanation is that throughout

psychodynamic treatment patients acknowledge their negative and painful emotions, become better able to tolerate them, and as a result their well-being improves. This explanation is consistent with current psychodynamic thinking that emphasizes the capacity to sustain and tolerate negative and painful emotions as a sign of emotional growth (Ogden, 2005).

The data-driven approach to clustering the CCRT categories adds several strengths to the existing method. First, it yields clusters that consist of different combinations of the basic CCRT components, thus revealing dominant patterns of *interaction* between self and other. Interestingly, in our results, all the clusters involved categories from all three CCRT components (W, RO and RS). This finding lends further support to Luborsky's initial premise that internalized interpersonal relationships consist of wishes, responses from the other and responses of the self, and supports the fundamental backbone of the CCRT structure. Each cluster seem to represents a mental representation of a particular type of interaction. For example the fine-grained cluster "in a happy relationship" includes the Wishes to be close, loved, open and happy; the Other responses are being loving, open and happy; the self loves the Other and feels happy and loved. In the cluster "Abandoned" the wishes are Not to be abandoned and hurt and to be liked; the responses of the other are doesn't like me, is distant, bad and not trustworthy; and the responses of self are feel hurt, unloved, other hurts me and I am disappointed. The result of obtaining such coherent clusters achieves our goal of identifying the themes that are represented by them and makes it possible to compare subjects on the same set of interactional patterns.

Second, this approach enables greater flexibility in the statistical analysis as it allows researchers to determine the appropriate number of clusters to be used, rather than being constrained to a pre-specified partition into 24 clusters (Barber et al., 1998). When limited data are available, using a relatively small number of clusters could be the only way to extract statistically significant results. Moreover, the data can be explored in terms of different clustering resolutions, each with a different number of clusters, which can lead to complementary sets of results. Here, we decided to consider a high-level partition into three clusters, and a more detailed partition into 10 clusters. In principle, various statistical techniques could be used to determine the appropriate number of clusters to be considered for a given dataset (see, e.g., Tibshirani, Walther, & Hastie, 2001). Finally, another potential strength of the proposed clustering method is its agnostic nature, in that clusters reflect the statistical properties of the particular dataset. In particular, it may be that different clusters will emerge when different populations are considered, thus providing additional insights into the differences between populations as reflected by the CCRT results. In contrast, if the same clusters are repeatedly identified automatically for different populations, it may suggest that these clusters are associated with generic mechanisms that deserve special attention. A replication of this approach on different populations is needed in order to examine this question.

The limitations of this study should be noted. First, the quality of the clusters obtained by the proposed method relies heavily on the quality and the magnitude of the data. In particular, the fact that the clusters reported in this work were obtained based on data collected from a relatively small study population of 72 individuals at only two time points may raise concerns regarding the stability of these clusters. In this context, we find it encouraging that the partition obtained with $K=10$ clusters represented an almost perfectly fine-grained resolution of the partition obtained *independently* by the algorithm for $K=3$ clusters (see Table III). If the clustering results were unstable, one would expect the partition with 10 clusters to be only vaguely related to the partition with three clusters, if at all. This is clearly not the case in our results. In addition, from a more qualitative perspective, the obtained clusters seem to represent fairly coherent and intuitive themes, as reflected in Table III. For example, a clear distinction in the obtained clusters between "positive" themes (first four clusters) and "negative" themes (next four clusters) was revealed completely automatically by the clustering algorithm. Nonetheless, future research should repeat the analysis reported here for data collected for larger populations of adolescents, to further validate the stability and reliability of the clusters reported in this work.

Second, in this study we used a community group rather than a formal "control group." Although the two groups were equivalent in terms of local variables (schools, age, socio-economic status) they differed in the focal ones (Shadish & Cook, 2009). Creating a control group in this study posed an ethical dilemma which would have involved putting adolescents "on hold" for a year before providing psychotherapy. Furthermore, since our purpose in this study was not to prove the effectiveness of psychodynamic therapy compared to no treatment or to other types of treatments, but rather to differentiate between processes that occur in psychotherapy versus processes that occur naturally with all adolescents, our control group was adolescents in the community who were not in treatment during the research period. It is thus impossible to

conclusively infer that the differences between the treatment and non-treatment groups were caused by the treatment, only that they were associated with the treatment. In order to exclude as many alternative explanations of the results as possible under these circumstances, we controlled for demographic variables in our analysis and randomly chose the community group. This design offers a balance between external and internal validity and as such constitutes a theoretical development that should be replicated and elaborated in further studies.

Third, although we demonstrated that changes in the scores for two of the three high-level clusters were significantly correlated with changes in symptoms, we cannot determine whether changes in the clusters cause symptom change or vice versa or whether both change as a function of a third factor, only that there was an association between the two, while controlling for initial levels. Additionally, in the current study we measured the different variables at two time points during treatment (beginning of treatment and a year later) due to difficulties in this age group with persisting in their commitment to the research. Therefore we can only infer that there were associations between changes in the clusters and changes in the outcome measures but we cannot determine which variable changed first. In future research, it would be advisable to conduct this assessment on multiple occasions during treatment to provide information on the timeline and sequence of changes (Kazdin, 2007). Another limitation is that all measures in this study are self-reports and method variance may account for some of the findings. However, it is important to add that the RAP interviews, althought reflecting the adolescent's point of view, are not purely self-report since they are rated by a team of clinical judges. Finally, in this study relationships were assessed solely from the point of view of the adolescents. In future studies it would be worthwhile to explore the point of view of the parents as well.

This naturalistic study lends weight to several other studies that have attempted to demonstrate a relationship between changes in internal processes and changes in symptoms in the course of psychodynamic therapy (Bond & Perry, 2004; Perry & Bond, 2000). In the field of psychodynamic psychotherapy with adolescents, such studies have only recently begun to appear in the literature (e.g., Harpaz-Rotem & Blatt, 2009; Harrison, 2003). Clearly additional studies with larger samples based on psychodynamic theory which examine internal processess that transpire throughout therapy are needed to better understand the nature of changes that occur during the treatment of adolescents.

Our results have several clinical implications. Though the internal representations of each person are unique, identifying typical internal representations that characterize subgroups of adolescents can help a clinician differentiate between normative and non-normative parent-adolescent conflicts. In addition, the findings that adolescents in treatment experienced an increase in close and supportive internal representations while maintaining a relatively high level of emotionally painful representations illustrate the type of outcome that is expected in psychodynamic therapy. Psychodynamic treatment offers patients an opportunity to develop a broader range of possibilities to perceive and react in their interpersonal relationships, while simultaneously expanding their ability to sustain and tolerate painful emotions. In the treatment of adolescents, where parents are still very present in the patients' lives as real objects and not only as internal representations, these features may have a crucial impact.

Note

1 An implementation of this algorithm is freely available at http://quantbio-tools.princeton.edu/cgi-bin/Iclust. The Matlab code is freely available upon request.

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