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**Assessing the Mechanism of Change of Functional Analytic Psychotherapy: An
Exploratory Analysis of a Process-Based Behavioral Intervention**

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Abstract

Identifying why and how psychological interventions work is one of the core areas of development in the current agenda of empirically based interventions. A process-to-outcome research approach was employed to examine the treatment effects and mechanism of change of Functional Analytic Psychotherapy (FAP), a process-based intervention focused on enhancing interpersonal repertoires. A non-concurrent multiple baseline design was conducted to evaluate the effects of FAP in three clients presenting with clinically relevant levels of psychological distress and interpersonal difficulties. FAP's claimed mechanism of change (contingencies of reinforcement) was evaluated by assessing the probability with which therapists provided behavioral procedures (TCRBs) following clients' responses in session (CRBs). Probabilities of contingent reinforcement were calculated through a lag sequential analysis. Between-Case Standardized Mean Difference (BC-SMD), Simulation Modeling Analysis (SMA), and Non-Overlap Analysis of all Pairs (NAP) tested between and within participants treatment effects. Results showed that high levels of contingent reinforcement (i.e., probabilities above 60%) were responsible for clinical changes on psychological distress and interpersonal difficulties. No moderation effects of therapeutic relationship factors such as therapeutic alliance and therapeutic relationship intimacy on treatment outcomes were observed. Limitations associated with reliability on the data collection level, coding, and design are discussed. Recommendations for replication and extension in other contexts and population are also presented. The role of interpersonal competence on psychological distress and an explanatory process-to-outcome model of FAP is summarized.

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Introduction

Behavioral therapies comprise an important part of the psychological interventions available for typically-developed verbal clients (i.e. individuals who do not have history of neurological or developmental impairment). Most Empirically-Based Treatments (EBTs) are based to some degree on behavioral principles (i.e. reinforcement); indeed, 52.5% of psychological treatments listed by the Society of Clinical Psychology include some form of behavioral principles (APA, 2018). However, the majority of EBTs lack sufficient data demonstrating the link between therapeutic procedures, theoretically based principles (i.e. behavioral principles), and outcomes. Rosen and Davison (2013) pointed out that many EBTs have poor conceptual-level support which has led to two main problems. First, it is difficult to discriminate which procedures within a therapeutic package produce change. This results in the inclusion of components that likely do not contribute to therapeutic change. Second, there is a proliferation of treatments that may target similar processes (e.g. Eye Movement Desensitization and Reprocessing for Post-Traumatic Stress Disorder, Prolonged Exposure for Post-Traumatic Stress Disorder) thereby increasing the burden of dissemination.

The Chambless et al. (1998) guidelines provided preliminary criteria for treatment efficacy. However, as Carrascoso and Valdivia (2007) later discussed, EBT research undervalues efficiency, diversity, and inclusion of processes of change. In addition, the emphasis of the Chambless et al. criteria was on demonstrating symptoms reduction, but not effects on people's quality of life, nor did they consider cost-effectiveness (Carrascoso & Valdivia, 2007; David & Montgomery, 2011; Follette & Beitz, 2003).

Such limitations led the Society of Clinical Psychology to adopt new standards based on Tolin, McKay, Forman, Klonsky, and Thombs (2015) analyses to validate psychological treatments. Current EBTs criteria include:

1. Identify treatment strength based on systematic reviews rather than individual studies.
 - a. Consider clinical significance in addition to statistical significance.
 - b. Consider long-term efficacy in addition to short-term efficacy.
2. Present quantitative information about treatment strength.
3. Make specific recommendations based on clinical outcomes and the quality of the available research.
4. Include functional or other health-related outcomes as well as symptom outcomes.
5. Address generalization of research findings to non-research settings and diverse populations.
6. Evaluate and encourage dismantling research to identify empirically supported principles of change.
7. De-emphasize diagnoses and emphasize syndromes/mechanisms of psychopathology. (p. 320)

Tolin's et al. (2015) criteria are relatively new and a reevaluation of treatments' strength is in progress. Questions on the type of research needed to meet such criteria have recently emerged. Some researchers argue that the major challenge clinical science currently faces is shifting the focus from syndromal based categories to process based dimensions to explain and produce meaningful clinical changes. Hofmann and Hayes

(2019) stated that some psychological treatments, particularly Cognitive Behavioral-Therapy (CBT), have made a titanic effort to consolidate empirical support. Nonetheless, CBT's extreme emphasis on developing treatments to target particular syndromes have diverted attention from specifying important theoretical and philosophical assumptions as well as the relationship between mechanism of change and outcomes. As a consequence, conceptual and empirical incongruence emerged between the number of empirically validated treatments and their lack of philosophical coherence, making clinical science unclear about why therapy works and what specific procedures actually produce therapeutic outcomes (Kazdin, 2007). These limitations have slowed the progress of interventions for complex clinical presentations such as personality disorders or comorbid problems.

An Alternative to Syndromal-Based Treatments: Process-Based Therapies

Syndromal categories are based on a collection of symptoms and signs consistently observed by experts (Hayes & Follette, 1992). Experts developed a significant number of syndromal categories with the aim of facilitating assessment, prognosis, and treatment planning. However, syndromal-based diagnoses have not kept its promises. Diagnoses have not been demonstrated to facilitate assessment or improved interventions for treating psychological problems. Resources and time have been invested to assess the utility of syndromal-based approaches. Yet outcome research has primarily assessed treatment effectiveness by measuring symptoms reduction. Evidence remain unclear regarding results for complex and diverse problems, efficiency, quality of life, and so forth. In fact, these limitations persist despite of the amount of research and money invested since the beginning of the syndrome era. For decades clinical scientists

have repeatedly indicated that syndromal classifications have little predictive and treatment utility (Hayes & Follette, 1992), a high degree of overlap and comorbidity (Brown & Barlow, 2009), modest reliability and validity (Brown & Barlow, 2009; Sauer-Zavala et al., 2017), problems performing systematic reviews and meta-analysis (Insel et al., 2010; Sanislow et al., 2010), and unclear explanatory mechanisms (Insel, 2010; Hoffman & Hayes, 2019).

Currently several research centers and professional organizations (e.g., Society of Clinical Psychology) support more a transition from a syndromal-based to a process-based approach. For instance, in 2010, the National Institute of Mental Health (NIHM) reframed its research agenda moving into a Research Domain Criteria (RDoC) framework, a project that seeks to establish an evidence informed clinical classification based on data from genetic, biological, cognitive, emotional, and behavioral mechanisms (Cuthbert, 2014a, 2014b; Insel et al., 2010). The RDoC framework has two main goals: 1) understanding and explaining behavioral disorders, and 2) facilitating the development of valid and reliable interventions that alter mechanisms underlying psychological disorders. This approach strengthens the role of empirically based theory and processes in the development of interventions (Hofmann & Hayes, 2019).

Changes in the research agenda of behavioral health have boosted the investigation of explanatory processes of change involved in behavioral problems and treatments. This recommendation is not new in behavioral sciences. For example, Kazdin (2007) refined the definitions of the theoretically grounded processes involved in psychotherapy emphasizing the importance of specifying moderators, mediators, and

mechanisms of change. Moderators are factors that influence the magnitude or direction of the relation of independent and dependent variables.

Mediators and mechanisms of change refer to explanatory processes of the relation between interventions and outcomes. Such processes are the result of therapeutic interactions throughout therapy session that lead to changes in people's psychological concerns and functioning (Crits-Christoph, Gibbons & Mukherjee, 2013). To test such relations, a temporal link between the occurrence of the intervention, the causal factor, and the outcome should be demonstrated (Kazdin, 2007). Kazdin (2007) claimed that mediators are proxy variables (constructs) that demonstrate an important statistical contribution to the relation between treatments and outcomes. In other words, mediators, account for some or all the variance between the predictor and the outcome. Mechanisms of change are particular functional processes that demonstrate a conditional relationship between procedures and outcomes, explaining why change is produced by identifying the causal steps in this relationship (Kazdin, 2007). While research on mediation relies on statistical procedures to test a covariation between variables, sometimes derived from correlational studies (Elliott, 2010; Kazdin, 2007), mechanisms of change research is focused on experimental research that examines causal pathways from therapists actions to treatment outcomes (Boswell, 2015; Kazdin, 2007).

Process-outcome research has emerged as an alternative to syndromal-based research, focusing on understanding how and why interventions produce treatment outcomes. This research assesses the degree to which process variables are related to treatment outcomes (Boswell, 2015; Crits-Christoph, Gibbons & Mukherjee, 2013). In this line of thought, process-outcome psychotherapies are commonly conceptualized as

interventions focused on implementing procedures that tackle specific causal variables underlying clinical problems (Crits-Christoph, Gibbons, & Mukherjee, 2013).

Moving forward: Process-Outcome Research Agenda

Most process-based research have been developed under the umbrella of transdiagnostic research that study mediator processes responsible of therapeutic change. Transdiagnostic approaches organize disorders among common characteristics (e.g., anxiety sensitivity, temperament, negative affect) that constitute psychological processes to develop intervention that modify such causal variables (Sauer-Zavala et al., 2017). Transdiagnostic research has studied biological and cognitive mechanisms that may explain psychological problems (Krueger & Eaton, 2015) from a more dimensional and functional approach (Sauer-Zabala et al., 2017). For instance, Craske (2012) hypothesized that some biomarkers and cognitive biases (i.e. negative and positive affect) would be responsible for triggering anxiety and depression. Consequently, procedures intervening on those processes would be effective in treating either of these disorders.

Although promising, the transdiagnostic approach presents several limitations that affect their validity and utility. One issue is what are the criteria used to define transdiagnostic processes. Sauer-Zavala et al. (2017) highlight two types of transdiagnostic processes, descriptive and mechanic. Descriptive transdiagnostic processes are hypothetical constructs that explain several disorders but lack evidence regarding how they are connected between classes of disorders (e.g. self-esteem). Mechanistic transdiagnostic processes include constructs that provide information about their relationship to symptoms across psychological problems (e.g., rumination) and inform treatment decisions. However, none of these approaches have untangled these

constructs from merely hypothetical constructs, thwarting a coordinated research agenda on processes of change.

Sauer-Zavala et al. (2017) added two main limitations with relating transdiagnostic processes to the word *diagnosis*. First, diagnoses are based on experts' consensus rather than empirical evidence. In doing so, some transdiagnostic constructs can maintain their status as explanatory factors even though they lack empirical support. Second, symptoms and signs remain as fundamental elements to reorganize classes of disorders, giving data from process-research secondary status (Sauer-Zavala et al., 2017). In addition, transdiagnostic treatments still do not present a clear pathway to make therapeutic decisions based on the relationship among procedures, process of change, and outcomes (Hofmann & Hayes, 2019). Manuals in transdiagnostic treatments (e.g., Unified Protocol for Transdiagnostic Treatment) list a series of procedures that theoretically may address processes of change and produce therapeutic outcomes (Ellard, Fairholme, Boisseau, Farchione, & Barlow, 2010). However, these protocols remain inconclusive about what type of therapeutic procedures, for whom, and under what circumstances therapy works. These are questions that have been in the center of the clinical research for decades since Gordon's Paul (1967) formulated them and that seems unaddressed by transdiagnostic perspectives.

A meta-analysis that compared transdiagnostic interventions and treatment as usual for anxiety and depression found significant effect sizes in favor of transdiagnostic treatments. However, the quality of these studies was poor, and results were inconclusive (Newby, McKinnon, Kuyken, Gilbody, & Dalgleish, 2015). Norton and Philipp (2008) conducted a quantitative review to establish the effect sizes of transdiagnostic

interventions based on the manipulation of procedures that targeted Negative Affect (NA), a mediational variable that implies a biological connection with psychological problems and has been studied in mood and affective disorders. Moderate to high effect sizes were found after analyzing those studies. Like syndromal-based packages, transdiagnostic treatments analyzed by Norton and Philipp (2008) lacked analyses of the mechanisms of change that would explain clients' behaviors and therapeutic effectiveness. Indeed, transdiagnostic interventions described in this review involved multiple procedures whose connections with NA and biological mechanisms of change proposed were not experimentally tested. These authors found that similar techniques were included in all the interventions and the rationale for implementing one or another strategy was unclear.

Hofmann and Hayes (2019) mentioned that research on processes of change may have confounded *therapeutic procedures* and *therapeutic processes*. They stated that researchers have assessed processes using fidelity measurements, assuming that common therapeutic procedures translate into common mechanisms of change. Hoffman and Hayes provide the following definition for distinguishing one of another:

Therapeutic procedures are the techniques or methods that a therapist utilizes to achieve the treatment goals of the client [...] Therapeutic processes *are the underlying change mechanisms that lead to the attainment of a desirable treatment goal [italics were included]*. We define a therapeutic process as a set of theory-based, dynamic, progressive, and multilevel changes that occur in predictable empirically established sequences oriented toward the desirable outcomes (p.38)

Increasing process-research on mechanisms of change would help to overcome limitations of research focused on mediational processes, particularly, traditional transdiagnostic research. Some of the goals of research on mechanisms of change include identifying proximal mechanisms of change, strengthening process-outcome therapies, and increasing precision and fidelity of therapeutic procedures (i.e. examining what procedures, for whom, and under what circumstances are more effective for clients).

Process-outcome research and mechanism of change. Research on mechanisms of change within the transdiagnostic approach is limited. Most studies have invoked biological and genetic mechanisms to explain their results, yet they have failed in providing sound experimental evidence that connects genetic and biological mechanisms to therapeutic outcomes (Norton & Philipp, 2008). The focus on biological processes has ignored the role of behavioral processes in therapeutic change. Transdiagnostic researchers recently have highlighted the importance of studying behavioral and cognitive mechanisms within therapy, shifting their focus from mediational research to mechanism of change (Boswell, 2015; Boswell, Anderson, & Barlow, 2014; Elliott, 2010).

Mechanisms of change research implies an examination of the causal links between treatment and outcomes. For this purpose, studies in mechanisms of change should demonstrate a causal pathway between therapeutic actions and outcomes (Boswell, 2015; Kazdin, 2007). Boswell (2015) identified three major problems in current research on mechanisms of change. First, most studies evaluated treatment fidelity by randomly selecting few therapy sessions to be coded. Coding a small number of random sessions provides a biased outlook of how mechanisms of changes function

throughout the whole therapeutic process (Elliott, 2010). Second, most investigations conducted between-subjects designs, assuming putative mechanisms of change relate to distal treatment outcomes. In this scenario, time intervals could bias the connection between therapeutic actions and outcomes and conclusions may be a result of a methodological artifacts. Third, most data in this area came from correlational analyses that assessed the relationship between treatment fidelity (therapeutic procedures) and outcomes. These analyses did not offer strong experimental control of extraneous variables that may have also explained changes over outcome variables.

In this case, process-outcome research on mechanisms of change would benefit from implementing methodologies that capture proximal relationships among procedures, processes, and outcomes. In this scenario, single case designs (SCD) are a comprehensive alternative to investigate mechanisms of change (Boswell, 2015). These designs have high internal experimental control due to participants serving as their own control (Hayes, Barlow, & Nelson-Gray, 1999). In SCD, participants' behaviors are systematically and continually measured. Ongoing assessment of variables provide information on proximal relationships among treatment, processes, and outcomes (Boswell, 2013, 2015; Boswell et al., 2014), as well as data of potential confounding artifacts that may influence those relationships (Hayes et al., 1999).

Analyses of sequential processes is another research area that would complement efforts in identifying mechanisms of change and aid in overcoming limitations of correlational analyses in assessing such processes. Microanalysis sequential process methods study dependencies between therapists' and clients' behaviors within therapy sessions (Elliott, 2010). This type of study accounts for the probability of occurrence of

clients' behaviors due to therapeutic actions, capturing functional relationships in the therapeutic process as they occur within the session.

A combination of traditional process-outcome and microanalysis sequential process research was employed in this study to examine the relationship between FAP, a behavioral oriented therapy, reinforcement (mechanism of change), and outcomes. This research had the aim to fill what Elliot (2010) named as the *process-to-outcome gap* within behavioral-process based psychotherapies.

Functional Analytic Psychotherapy (FAP): A Behavioral-Process Based Psychotherapy for Interpersonal Difficulties

Process-driven research using empirically supported behavioral principles is virtually nonexistent. A behavioral process-based approach acknowledges that psychological problems are under the control of mechanisms that can be directly influenced to produce treatment outcomes (Rosen & Davison, 2003). Research in basic processes in behavioral interventions will provide therapists with strategies to directly modify the behaviors in context that control psychological problems. For such an endeavor, functionally based targets and treatments need to be specified.

Maitland and Gaynor (2012) suggested that interpersonal difficulties meet the criteria for a functional description of psychological problems due to their association with multiple forms of psychopathology, multiple assessments for measuring these difficulties, and their association with maintaining environmental factors. The interdependence between individuals' behavior and their social environment (the functional relation) is likely at the base of psychological problems that involve interpersonal features. For instance, problems that have been usually categorized as

mood, anxiety, and personality disorders within the syndromal based literature would be understood either as: (a) difficulties in obtaining valued social reinforcers, (b) excesses maintained by social consequences or, (c) avoidance of social contexts (Darrow & Follette, 2014; Ferster, 1973; Follette, Naugle & Linnerooth, 2000; Staats, 1996). The type of consequences people receives determine the functional classes to which interpersonal behaviors are related, though the topography of the responses may be different. In other words, multiple contingencies of reinforcement maintain different clusters of functional classes, regardless of the response topography. Based on that, assessing functional processes instead of symptoms or signs of interpersonal difficulties would be critical to determine the therapeutic procedures to be implemented for problems within the interpersonal difficulties class.

Regarding the mechanisms of change in behavioral interventions, a behavioral explanatory process that has been typically investigated is, of course, reinforcement. Behavioral psychology is founded on the investigations conducted by B.F. Skinner on the variables that influence and predict the behavior of the organism. He and his colleagues conducted several studies in the laboratory with non-human animals, demonstrating that the probability of occurrence of the behavior is determined by its consequences (Ferster & Skinner, 1957). Although Skinner's mission was to translate these findings, in particular verbal behavior, into sound applications to human affairs, most of these applications ended up being constrained to utilization by practitioners and researchers in the field of developmental disabilities. They developed a strong body of interventions that have demonstrated effectiveness of differential reinforcement with these populations (i.e., Hagopian, 2017), showing that functionally driven interventions based on functional

analyses can produce strong treatment outcomes in humans (Hurl, Wightman, Virues-Ortega, & Haynes, 2016).

Functional Analytic Psychotherapy (FAP; Kohlenberg & Tsai, 1991) is a behavioral process-based intervention in which therapeutic change is produced by therapists' actions relative to clients' behaviors in-session (Clinically Relevant Behaviors; CRB). FAP states that contingent reinforcement is the mechanism of change that should be modified to produce treatment outcomes in and outside of the clinical setting. FAP assumes that people's interpersonal repertoires are emitted in session because therapists are members of client's verbal community and therapists' behaviors may have functions similar to other individuals within the clients' environment, that is, they are part of the same functional class (Kohlenberg & Tsai, 1991). A functional class refers to a group of responses that may have different topography but have the same function or effect in the environment (Follette, Naugle, & Linnerooth, 2000).

Bonow, Maragakis, and Follette (2012) have suggested that because of the functional nature of FAP, it is important to have a principle-based case conceptualization in order to appropriately select targets for change. Hayes and Follette (1992) discussed the utility of adopting a functional perspective in conceptualizing psychological problems, proposing a functional diagnostic approach guided by principles. In this context, a Functional Behavioral Assessment (FBA) of behaviors and environment is needed to identify therapeutic targets within a behaviorally oriented psychotherapy (Davison, 2019; Hofmann & Hayes, 2019). According to Cooper, Heron, and Heward (2014), the FBA is "a systematic method of assessment for obtaining information about the purposes (functions) a problem behavior serves for a person" (p. 8). In sum, FAP is a

therapeutic model that could serve as an exemplar for behavioral principle-based interventions since it targets topographically different difficulties (as will be presented below) that have the same function and are shaped by the therapist within the clinical setting.

Two contextual behavioral therapies, Acceptance and Commitment Therapy (ACT) and Functional Analytic Psychotherapy (FAP) have promoted process-outcome research to identify their mechanisms of change in typical clinical settings. Though most ACT studies on explanatory processes have investigated psychological flexibility as the mediator of psychological suffering (Levin, Hildebrandt, Lillis, & Hayes, 2012), some other research has argued that its basic principle is the transformation of functions in clients diagnosed with schizophrenia (Villatte, Monestès, McHugh, i Baqué, & Loas, 2010). FAP has examined the effect of social reinforcement (delivered by therapists in session) on clients who present with mood and emotional problems (Esparza, Muñoz-Martínez, Santos, & Kanter, 2015; Landes, Kanter, Weeks, & Busch, 2013; Villas-Bôas, Meyer, & Kanter, 2016). These results have shown that FAP is useful in increasing effective interpersonal behaviors in and out of session (Singh & O'Brien, 2017). However, no published FAP-alone research has conducted a microanalysis or lag sequential analysis to identify conditional relationships between therapists' and clients' behaviors to account for its mechanism of change and its connection with treatment outcomes. Therefore, these preliminary process-outcome studies using ACT and FAP have only provided information on treatment outcomes but no data to fill the *process-to-outcome gap*.

The present study sought to explore the mechanism of change of FAP through examining the conditional relationship between therapeutic actions, reinforcement, outcomes, and mechanism of change research in Kazdin's (2007) words. The present research tests whether changing environmental consequences (e.g. social reinforcers) alters the occurrence of clients' interpersonal problems and goals. This translational study is an early step in a research program that focuses on behavioral intervention linked to mechanisms of change with the aim of simplifying and reducing the burden of psychotherapy training and dissemination. This might be accomplished by gathering together therapeutic tools that target similar behavioral mechanisms of change.

Objectives

This study sought to investigate the mechanism of change of Functional Analytic Psychotherapy (FAP). The following three objectives were explored:

1. To identify the mechanisms of change of FAP by analyzing contingent responding to participants' interpersonal behaviors in session.
2. To determine the effectiveness of FAP on shaping interpersonal functioning and reducing psychological distress of verbally able adults.
3. To establish the relation between the probability of reinforcement (proportion) and the changes in clients' interpersonal repertoires.

Method

Design

A non-concurrent multiple baseline design (NCMBL; Figure 1) across three participants with a follow-up phase was conducted (A/B/Follow-up). MBL allowed for comparisons across individuals, showing whether extraneous variables affected them in the same manner or not. The between-series comparisons controlled for threats to external and internal validity that may affected participants within the same study (Hayes et al., 1999).

A concurrent MBL was not implemented, because of limitations on participants' recruitment. NCMBL designs control for maturation and confounding variables through sequentially introducing intervention between participants. In addition, NCMBL test whether effects of IVs on DVs are the result of historical artifacts by comparing DV-IV relationship at different time lags (Wong, 2010)

Within the baseline (A), Supportive Listening (SL) was implemented. SL has been widely utilized in randomized control trials (Cuijpers et al., 2012), including the only RCT conducted in FAP (Maitland & Gaynor, 2016), as a control condition. SL is defined as “a psychological treatment in which therapists do not engage in any therapeutic strategies other than active listening and offering support, focusing on participants’ problems and concerns” (Cuijpers et al., 2012, p. 281). In this phase, therapists reflected on clients’ experiences and encouraged them to share emotional experiences. Therapists were prohibited from giving advice, making interpretations, and providing feedback to clients (Cuijpers et al., 2012).

FAP was introduced at phase B, where contingent reinforcement was administered by therapists to increase clients’ effective behaviors (CRB2s), and differential reinforcement was utilized to reduce clients’ problem behaviors (CRB1s) and create opportunities for alternative responses. Follow-up was conducted four weeks after the end of the FAP intervention phase. Questionnaires were administered to examine clients’ progress out of session.

Power Analysis and Sample Size

Sample size in this study included three participants. A high statistical power (above 0.84) was met, based on a prospective power analysis calculated through SPSS D_POWER macro designed by Marso and Shadish (2014) prior to recruitment. Hedges, Pustejovsky, and Shadish (2013) developed statistical procedures for calculating statistical power for single case designs (SCD). In this approach, power is function of the number of observations per phase, the number of cases, the intraclass correlation (ρ), the autocorrelation (Φ), the effect sizes (δ), and the nominal Type I error (α). In the current

study, power analysis was completed for 3, 4, and 5 cases who would be observed across 12, 14, 15, and 16 sessions/weeks. Shadish et al. (2014) recommendations for conservative intraclass correlations and autocorrelations were followed ($\rho=0.5$ and $\Phi=0.5$). Effect sizes utilized to calculate power analysis ranged between 1 and 1.9, based on results from a pilot case, and an $\alpha=0.05$ was employed by convention. Prospective power analysis is presented in figure 2.

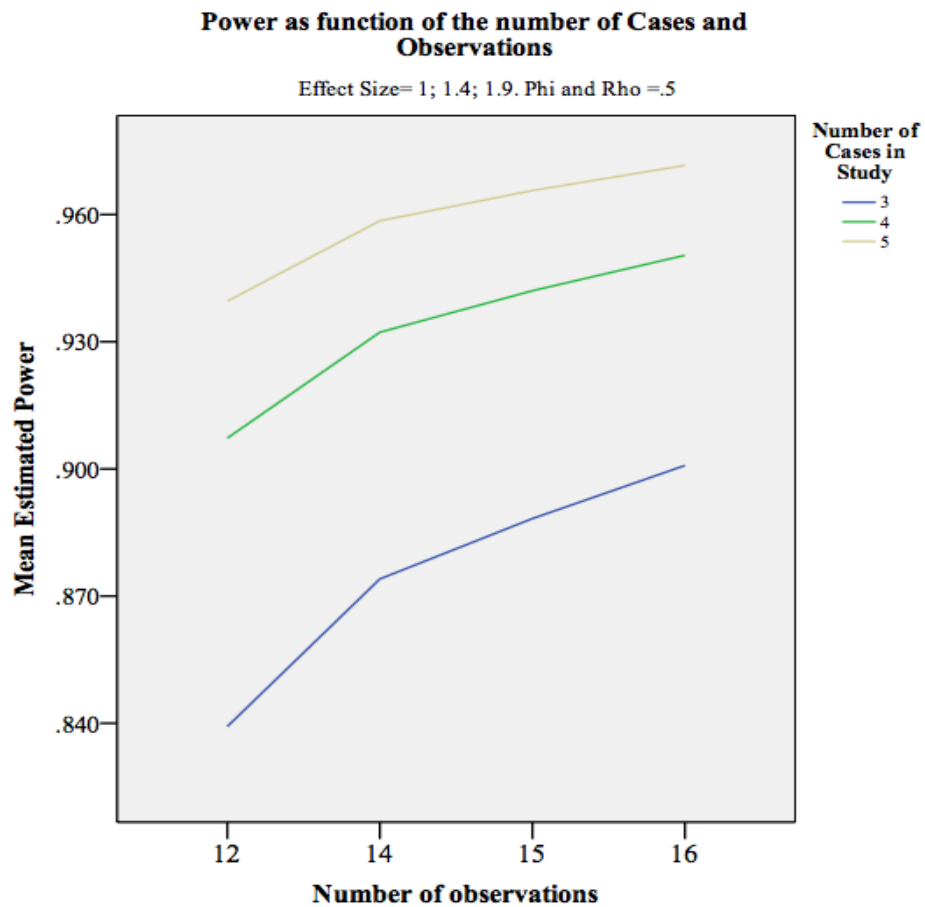


Figure 1. Power analysis for potential sample size and number of observations in the study.

Participants

Sixteen potential participants were recruited by public advertisement and third party (or snowball sampling) procedures. A flyer with a description of the study and researchers' contact information was posted on public billboards, and it was provided to staff in the Psychological Services Center (PSC) and the Counseling Services Center on a university campus (University of Nevada, Reno). Four potential participants did not pursue a further contact with researchers after contacting them.

An eligibility assessment was conducted by two un-blind doctoral students (therapists in the study) in the PSC to determine participants eligibility based on following inclusion criteria: (a) reporting interpersonal relating difficulties, (b) endorsing clinical levels of psychological distress, (c) identifying themselves as needing services, and (d) agreeing to have sessions videotaped and coded by the researchers. Interpersonal relating difficulties were assessed using the Functional Idiographic Assessment Template-Questionnaire-Short Form (FIAT-Q-SF; Darrow et al., 2014) and conducting a clinical interview based on the Functional Idiographic Assessment Template (FIAT) manual (Callaghan, 2006). Psychological distress was evaluated using the Depression Anxiety Stress Scales (DASS; Lovibond & Lovibond, 1995). Based on DASS criteria provided by Crawford and Henry (2003), participants' level of distress was established. A clinical interview (Appendix A) was conducted to validate the impact of interpersonal dysfunction and psychological distress on participants' life and their interest in receiving psychological services. Exclusion criteria such as a current substance abuse disorder, suicidal plan, past suicidal attempts, or a history of psychotic or bipolar disorder were

also assessed in the eligibility interview. Potential participants who reported concurrently receiving psychotherapy were also excluded.

Following the eligibility screening, four participants were excluded. One participant denied granting researchers to videotape therapy session. Another participant was currently receiving therapeutic services from another provider in the community; and two other participants did not meet criteria for psychological distress according to DASS clinical cut off. Referral information for clinical services available in the PSC and the community for their presenting problems were provided at the end of the eligibility session to those not participating in the trial.

Six participants were initially enrolled and randomly assigned to baseline lengths (Appendix B). Sociodemographic characteristics (Table 1), psychological distress (Table 2), and interpersonal functioning (Table 3) did not differ across participants at baseline. After starting baseline, three participants dropped out and two additional participants were enrolled.

Table 1.

Participants' sociodemographic information.

Participant in order of recruitment	Age	Sex	Race/ Ethnicity	Sexual Orientation	Educational Level	Marital Status
Arya**	20	Female	White-American	Heterosexual	College Student	Single
P2*	18	Female	Asian-American	Heterosexual	College Student	Single
P3*	23	Male	White-American	Gay	Some College	Single
P4*	22	Female	Latino/Hispanic	Bisexual	College Student	Single
P5*	28	Male	White-American	Heterosexual	High School	Married
P6*	48	Female	East-Indian	Heterosexual	College	Married
Catelyn **	49	Female	White-American	Heterosexual	College	Married
Sansa**	23	Female	Latino/Hispanic	Heterosexual	College Student	Single

*Dropped out

**Fictional names

Table 2.

Participants' psychological distress at enrollment.

Participants in order of recruitment	Depression Anxiety Depression Scale (DASS-42) Percentile				DASS Clinical Level		
	D	A	S	Total	D	A	S
Arya**	55	97	65	91	Normal	Severe	Severe
P2*	96	98	94	97	Severe	Severe	Severe
P3*	99	79	90	96	Extremely Severe	Mild	Moderate
P4*	98	98	98	99	Severe	Severe	Severe
P5*	98	99	98	99	Severe	Extremely Severe	Severe
P6*	88	94	45	86	Moderate	Moderate	Normal
Catelyn**	95	92	85	93	Severe	Moderate	Mild
Sansa**	98	86	85	94	Extremely Severe	Mild	Mild

D= Depression; A= Anxiety; S= Stress.

*Dropped out

**Fictional names

Table 3.

Participants' interpersonal functioning at enrollment.

Participants in order of recruitment	FIAT-Q-SF ^a (Raw data)							FIAT-Q ^b (Raw data)				
	AI	AD	CR	CA	EEE	EE	Total	AN	BC	C	D	EE
Arya**	-2	11	12	-1	-2	1	19	64	64	65	61	51
P2*	9	-10	6	1	2	-5	3	81	74	73	85	69
P3*	18	-19	-11	8	-1	-15	-20	67	81	58	89	80
P4*	10	-7	-3	4	1	-10	-5	82	83	78	92	100
P5*	8	6	-5	3	2	-13	1	94	52	84	78	90
P6*	0	-21	-12	9	-2	-3	-29	77	62	62	62	59
Catelyn**	7	-5	-4	9	2	-1	8	88	89	81	88	91
Sansa**	6	-8	-12	0	7	-10	-17	90	79	82	90	81

AI= Avoidance of interpersonal intimacy; AD= Argumentativeness or disagreement; CR= Connection and reciprocity; CA= Conflict aversion; EEE= Emotional experience and expression; EE=Excessive expressivity; AN= Assertion of needs; BC= Bidirectional communication; C=Conflicts; D=Disclosure; EE= Emotional Experience.

*Dropped out

**Fictional names

^a Functional Idiographic Assessment Template-Questionnaire Short Form.^b Functional Idiographic Assessment Template-Questionnaire.

Final sample size consisted of three participants, due to other two participants dropping out the study. Reasons for dropping out (Table 4) were not related to treatment implementation. Three participants dropped out during the SL baseline, and two others dropped out because of personal life's events such as moving to another towns or vacations a couple sessions after introducing FAP. A comparison of DASS-42 scores among participants who dropped out showed that therapy sessions did not produce an iatrogenic effect psychological distress (Appendix C). In fact, all participants reported some degree of improvement by the last session on therapy. Therefore drop-outs were unlikely related to factors within the therapeutic setting.

Table 4.

Participants' reasons for dropping out.

Participants	Reasons for dropping-out	Dropout Phase
P2	Participant went back home for vacation.	Intervention
P3	Participant reported feeling that BL approach was unhelpful.	BL
P4	Participant moved out of town.	Intervention
P5	Participant no-call no-showed and did not respond to research follow-ups.	BL
P6	Participant reported feeling pessimistic about treatment, due to presenting a longstanding history of mental health problems.	BL

Participants Case Conceptualizations. Participants' case formulation was organized on Muñoz-Martínez and Novoa-Gómez (2011) case conceptualization format. They presented high levels of psychological distress, reporting scores above 90th percentile in the total DASS-42 (Table 2). They also presented interpersonal difficulties in different areas measured by the FIAT-Q-SF (Table 3). Arya endorsed difficulties

expressing disagreements, feeling connected, and regulating emotional expressions.

Sansa and Catelyn reported avoidance of interpersonal intimacy, conflict aversion, and

difficulties identifying and expressing emotions. Idiographic case conceptualizations

(Table 5) were developed for each participant to adapt FAP interventions to their needs.

Table 5.

Participants Case Conceptualization

Arya	Sansa	Catelyn
<p>Arya presented problems asserting her needs. She often fitted her responses to other expectations, dismissed her needs, apologized other behaviors that have hurt her. She used to engage in self-deprecating verbalizations and take other opinions as “true” even though she did not think in a similar way. Usually, these responses were followed by approval and acknowledgement from others.</p>	<p>Sansa actively endorsed avoidance as her preferred behavioral strategy for handling sensitive topics in her life such as dating, religion, or how she spends her time, especially when discussing these topics with her family. In session, these problems presented as putting off making decisions or engaging in repetitive tacting of how unfair situations were. Sansa presented behavioral deficits such as struggles with making important decisions, difficulty tacting her emotional experience, and manding for what she needed and giving and accepting positive or negative feedback. In family conflict situations, she avoided discussing sensitive topics, only compromising when necessary. She was slow to trust others as a result of others letting her down or taking advantage of her. This manifested as failing to respond to prompts for disclosure by engaging in problematic behaviors, such as changing the topic or downplaying the original topic’s importance.</p>	<p>Catelyn presents as someone who had difficulties tacting her emotions, was overly self-critical, and engaged in exaggerated expression that were aversive instead of tacting emotions or making intimate disclosures that would better serve her interpersonal goals. Her behavior was controlled by multiple sources, that is, it was maintained by avoidance of punishment in intimate conversation, as well as social attention.</p>
<p>Arya presented avoidance of interpersonal conflicts. She changed the subject, go away, or isolated in circumstances in which she could be rejected or judged.</p>	<p>She also openly struggled with cultural identity related issues, especially around gender and sexuality and what role(s) she was comfortable or uncomfortable. She described a history of minimizing her needs and emotions in the presence of her friends and family and expressed difficulty with learning to identify who she could ask things.</p>	<p>Catelyn was raised in a traditionally patriarchal household and frequently conceptualizes behavior as a product of gender, resulting in some forms of rule governed behavior regarding herself and/or her husband.</p>
<p>These patterns of behavior were related to a limited emotional tacting and manding of what she needed, as well as problems discriminating opportunities in which disclosing emotions would be reinforced, particularly, with men. Arya met clinical criteria for severe anxiety and presented severe levels of stress. She was allocated on the 91th percentile for psychological distress when she was recruited.</p>	<p>Sansa met clinical criteria for extreme severe depression, mild anxiety, and mild levels of stress. She was allocated on the 94th percentile for psychological distress when she was recruited.</p>	<p>Catelyn met clinical criteria for severe depression, moderate anxiety, and mild levels of stress. She was allocated on the 93th percentile for psychological distress when she was recruited.</p>

Dependent Variables

Interpersonal difficulties comprise behaviors that interfere with social functioning (Maitland & Gaynor, 2012). In Callaghan's (2006) words, "[t]hese problems are based on the function of behaviors as they impact the client's ability to form effective interpersonal relationships" (p. 357). Lastly, interpersonal difficulties are defined based on the effects the behaviors produce in the individual's social environment (function).

Callaghan (2001) developed the Functional Idiographic Assessment Template (FIAT), a functional based classification for interpersonal relating difficulties. The FIAT describes interpersonal repertoires (classes of behaviors) given antecedent control and contingencies of reinforcement. Five functional interpersonal classes were the object of intervention in this study: (a) assertion of needs (including social support), (b) bidirectional communication, (c) conflict, (d) disclosure and interpersonal closeness (disclosing and seeking intimacy), and (e) emotional experience and expression. Problems in the FIAT classes (CRB1s) were targeted by altering the contingencies of reinforcement as specified in the description of the independent variable (see below), aiming to produce improvements in these functional classes (CRB2s).

Psychological Distress is defined as "the unique discomfoting, emotional state experienced by an individual in response to a specific stressor or demand that results in harm, either temporary or permanent, to the person" (Ridner, 2004, p, 539). This concept involves behavioral and emotional elements that impact people's functioning such as difficulties responding to demands and experiencing a high level of negative affectivity (Crawford & Henry, 2003). Lovibond and Lovibond (1995) proposed that negative affective states and common environmental activation factors are underlying explanatory

factors of psychological distress. They developed the Depression Anxiety Stress Scale (DASS-42) with the aim of assessing these constructs based on their functional characteristics instead of signs or symptoms. DASS factor structure was assessed by a principal components factors analysis that identified an orthogonal structure of three factors. A confirmatory factor analysis evaluated a latent common factor that could influence the three DASS components (Lovibond & Lovibond, 1995). Findings identified a common factor that influenced depression (50.4%), anxiety (74%), and stress (77.4%) variances, that constitutes a general index of psychological distress (Crawford & Henry, 2003).

Independent Variable

FAP is a behavioral process-based intervention that promotes clinical changes within the context of a meaningful therapeutic relationship. FAP therapists implement behavioral procedures to alter contingencies of reinforcement that maintain clients' behaviors (Follette, Naugle, & Linnerooth, 2000; Kohlenberg & Tsai, 1991). Based on a functional assessment, clinically relevant behaviors (CRBs) are identified. CRBs are classified as clinically relevant problems (CCR1) and clinically relevant improvements (CRB2s) in session. Mainly, FAP therapist evoke CRBs (ERB), provide differential reinforcement (TCRB1) with the aim of reducing CRB1s, and deliver positive reinforcement (TCRB2s) to enhance CRB2s. In addition, FAP therapists encourage clients to generalize CRBs changes to outside of the therapeutic setting while discriminating contexts where those behaviors could be reinforced or punished (Kohlenberg & Tsai, 1991).

Instruments and Apparatus

Functional Idiographic Assessment Template-Questionnaire Short Form (FIAT-Q-SF; Darrow et al., 2014). FIAT-Q-SF is a 32-items self-report in a 6-point Likert scale (from -3 to +3) based on a functional analytic approach assessing interpersonal functioning. Items are contained in six interpersonal factors that have moderate and good reliability using Cronbach's alpha: (a) avoidance of interpersonal intimacy ($\alpha= 0.82$), (b) argumentativeness or disagreement ($\alpha= 0.74$), (c) connection and reciprocity ($\alpha= 0.64$), (d) conflict aversion ($\alpha= 0.72$), (e) emotional experience and expression ($\alpha= 0.75$), and (f) excessive expressivity ($\alpha= 0.77$). Outcomes from FIAT-Q-SF found a $M=-16.56$ and a $SD= 18.3$, meaning scores above one SD of the M may present interpersonal difficulties. This instrument was administered in the eligibility session to evaluate participants' interpersonal difficulties. In addition, FIAT-Q-SF was administered in a weekly basis at the beginning of the session to evaluate participants' interpersonal functioning out of session throughout the study.

Functional Analytic Psychotherapy Rating Scale (FAPRS; Callaghan, Follette, Ruckstuhl Jr, & Linnerooth, 2008). The FAPRS is a coding system designed for assessing behaviors within the clinical setting based on behavior analytic principles. It provides standard codes (Table 6) to analyze client-therapist interactions during therapy sessions. Fourteen codes from the FAPRS were rated in this study to maintain FAPRS internal consistency. Clinically Relevant Behaviors (CRB1 and CRB2) and Therapists Effective Responses to CRBs (TCR1 and TCRB2) were the only codes included in the results section as research hypothesis were focused on the analysis of the causal path between therapists' therapeutic actions towards clients' responses in-session.

Table 6.

FAPRS codes of client and therapist behaviors (Callaghan et al., 2008, p. 64-65).

Code	Full Name of Code	Brief Description
CRB1	Clinically Relevant Behavior 1 (problems in session)	Client engages in problematic behavior in-session in the context of the therapeutic relationship.
CRB2	Clinically Relevant Behavior 2 (improvements in-session).	Client engages in improved behavior in-session in the context of the therapeutic relationship.
TCRB1	Therapist responds effectively to CRB1.	Therapist's response is to in-session client problem behavior.
TCRB2	Therapist responds effectively to CRB2.	Therapist responds effectively to in-session improvements.
O1	Discussion of clinical problems outside the therapeutic relationship ("outside CRB1s").	Client discusses or describes problem behaviors that have been the focus of treatment but that occur in other situations outside of session.
O2	Discussion of clinical improvements outside the therapeutic relationship ("outside CRB2s").	Client discusses or describes improvements that have been the focus of treatment but that occur in other situations outside of session.
CPR	Client positive session progression.	Client discusses or describes problems as they occur in situations other than the therapeutic relationship or clarifies or provides context about problems.
ERB	Therapist evokes a CRB by client.	Therapist evokes a clinically relevant behavior by the client, either CRB1 or CRB2.
TCRB1	Therapist responds effectively to CRB1.	Therapist's response is to in-session client problem behavior.
TCRB2	Therapist responds effectively to CRB2.	Therapist responds effectively to in-session improvements.
RO1	Therapist responds to client's discussion of clinical problems outside the therapeutic relationship (to "outside CRB1s").	Therapist comments on problem behaviors the client describes having engaged in outside of the therapy session.
RO2	Therapist responds to client's discussion of clinical improvements outside the therapeutic relationship ("to outside CRB2").	Therapist provides verbal reinforcement in response to the client describing improved behaviors outside of the therapy session.
TPR	Therapist positive session progression.	Therapist engages in generally effective or facilitative behavior.
IN	Generally ineffective therapist responding.	Therapist engages in generally ineffective behavior.

Functional Idiographic Assessment Template-Questionnaire (FIAT-Q; Darrow et al., 2014). FIAT-Q is a 111-items self-report in a 6-point rating scale (from 1 to 6). This measure is based on a functional analytic approach of interpersonal functioning. A five-factor structure constitutes this questionnaire: (a) assertion of needs and values, (b) bidirectional communication or giving and receiving feedback from others, (c) responding to conflict in social interactions, (d) disclosure or interpersonal intimacy, and (e) the experience and expression of emotions. FIAT-Q has strong construct validity and each of its subscales is highly reliable (Cronbach's alpha at $\alpha=0.74$ and higher). In this study, FIAT-Q was administered as a pre-test-post-test assessment of participants' interpersonal functioning.

Depression Anxiety Stress Scales (DASS; Lovibond & Lovibond, 1995).

DASS is a 42-items self-report scale developed to measure emotional states of depression, anxiety, and stress over the past week. The sum of DASS-42 scales provides an estimate of psychological distress. Each subscale in DASS contains 14-items rated in a 4-point rating scale (0=did not apply to me at all, 1= Applied to me to some degree, or some of the time, 2=Applied to me to a considerable degree, or a good part of time, 3=Applied to me very much, or most of the time). DASS has shown a consistent three-factorial structure, as well as convergent and discriminant validity (Crawford & Henry, 2003; Lovibond & Lovibond, 1995). DASS total score and their subscales have found a good reliability using the Cronbach's alpha: depression $\alpha=0.947$, anxiety $\alpha=0.897$, stress $\alpha=0.933$, and total score $\alpha=0.966$ (Crawford & Henry, 2003). Crawford and Henry (2003) provided the following cutt-off points for each category of the DASS based on normative percentiles: (a) normal (0-78 percentile), (b) mild (78-87 percentile), (c) moderate (87-95

percentile), (d) severe (95-98 percentile), and (e) extremely severe (98-100 percentile). Scores above 78 percentile in one or more of DASS subscales were indicative of psychological distress. This instrument was employed weekly to assess the degree of participants' psychological distress. The DASS was administered at the beginning of each therapy session.

Working Alliance Inventory-Short Revised (WAI-SF; Hatcher & Gillaspay, 2006). WAI-SF is a 12-items self-report inventory developed to characterize the therapeutic relationship. This instrument assesses therapist and client's feelings and attitudes regarding goals (objectives of therapy), tasks (agreement of the tools and strategies used by the therapist to reach the therapeutic goals), and bond (quality of the relationship between therapist and client). Every WAI-SF subscale includes four items rated in a 5-point scale (Always=5; Very often=4; Often=3; Sometimes=2; Seldom=1). The WAI-SF fits a model with a three-factor structure (Hatcher & Gillaspay, 2006) The total score and the three subscales have found a good reliability using the Cronbach's alpha: goal $\alpha=0.87$, task $\alpha=0.85$, bond $\alpha=0.80$, and total score $\alpha=0.91$. This instrument was administered at the end of therapy sessions to identify changes in clients' attitudes and feelings towards the therapist across therapy.

Functional Analytic Psychotherapy-Intimacy Scale (FAP-IS; Leonard et al., 2014). FAP-IS is a 14-item scale developed for assessing intimacy related behaviors based on a behavior analytic conceptualization. This instrument assesses three main components of intimacy: hidden thoughts and feelings (5 items), expression of positive emotions (4 items), and honesty and genuineness (5 items). Items are score based on a 7-point scale (0=not at all and 6=completely). FAP-IS factors demonstrated a moderate to

strong correlation among its subscales and presented good to excellent internal consistency using the Cronbach's alpha: hidden thoughts and feelings $\alpha=0.86$, expression of positive emotions $\alpha=0.93$, and honesty and genuineness $\alpha=0.92$. The FAP-IS total also showed an excellent reliability index ($\alpha=0.91$). This scale was administered after therapeutic sessions to evaluate participants' sense of intimacy within the therapeutic relationship.

Diary Card (Self-report record). A self-report record was utilized to assess participants' behavioral targets, and contextual events (antecedents and consequences) related to those behaviors. The diary card is used to gathering information about problematic and functional behaviors in participants' daily life as part of the functional behavioral assessment conducted in FAP.

Noldus Observer XT 11. Noldus is a software designed to coding video-recorded behaviors. This tool was utilized to code clients' and therapists' behaviors in session based on FAPRS codes. Independent coders rated the occurrence of FAPRS codes within therapeutic interactions. Noldus allowed us to calculate a Cohen's kappa reliability analysis based on sequence and time to establish consistency among coders' observations.

Procedure

Participants were asked to consent to research participation according to APA and local IRB standards during the eligibility screening (Appendix D). In Baseline (phase A), supportive listening was conducted in order to guidelines provided by Clore and Gaynor (2012) and Maitland and Gaynor (2016). An evaluation of participants' developmental, psychosocial, and sociocultural history (Appendix E) was also performed during baseline

using a semi-structured interview. During the first three weeks (this time frame was established as a minimum to identify behavioral and test hypothesis statistically; Hayes, Barlow, & Nelson-Gray, 1999; Shadish et al., 2014), intervention (phase B) was started at session four for Arya, session six for Sansa, and session seven for Catelyn. The active treatment condition (FAP) lasted 9 sessions. In session 1 of the FAP phase, therapist and client discussed interpersonal difficulties and alternative behaviors observed across BL. Participants were instructed on how to fill out the diary card and presented with the general rationale for how FAP is thought to produce change. This discussion included the following three fundamental assumptions in FAP: (a) therapeutic relationship is a real relationship, and as such, the participants would behave in ways like they do in other important relationships, struggling with problems and making gains just as they might in their natural environment (b) therapists respond in an honest way and provide feedback to participants with the aim of achieving their therapeutic goals, and (c) therapeutic relationship is a safe place to learn new ways to interacting. Subsequent FAP sessions included noticing the occurrences of CRBs, responding contingently to them, evoking CRBs and providing contingent differential and positive reinforcement to CRB1s and CRB2s, respectively.

Finally, DASS-42, FIAT-Q, and FIAT-Q-SF were administered in a 15 min follow-up to each session. Follow-up session took place four weeks after completion of the intervention with the aim of assessing participants' psychological distress and interpersonal functioning.

Therapists and Supervision. Two clinical psychology doctoral students with clinical psychology master's degrees conducted eligibility assessment, baseline, and

intervention in this study. Therapist-1 was a 3rd-year clinical doctoral student self-identified White-American male. Therapist-2 was a 4th-year student self-identified Latino female. While Therapist-1 saw Sansa and Catelyn, Therapist-2 saw Arya. Both therapists had education in behavior analytic principles and clinical behavior analysis. Throughout study, therapists received one-hour week supervision by a FAP supervisor. Supervision consisted of reviewing videotape, addressing therapists concerns about therapy, and providing feedback about therapists' performance in-session. Therapists had to review their clinical notes and videotapes before supervision, noting areas of growth to be addressed in following sessions.

Coding Procedures. Two coders blind to the study hypotheses rated therapeutic sessions that were presented in random order. Coders' training included conceptual and practical components. Conceptual training consisted of reading Kohlenberg's and Tsai's (1991) *Functional Analytic Psychotherapy* book, Cooper's et al. (2014) chapter in *functional behavioral assessment*, FIAT manual (Callaghan, 2006), and FAPRS manual (Callaghan et al., 2008). Training entailed a multiple exemplar training for one year and a half that was developed in three steps. First, coders rated eight therapeutic vignettes based on the FIAT interpersonal categories (Callaghan, 2006). Second, coders rated 12 therapeutic session (real therapeutic interactions not part of the study). Third, coders had to pass a test of reliability achieving a Cohen's kappa of $\kappa=0.75$ in a 10 min interval coding. Based on Ray and Ray (2008) coding training manual, coders went through the following phases:

1. Foundation: "CORRECT" and "INCORRECT" feedback was provided for each coding turn.

- a. If CORRECT: reasons for providing a positive feedback based on the FAPRS and the case conceptualization were provided.
- b. If INCORRECT: a definition of the incorrect code was provided. Subsequently, coders had the opportunity to assign an alternative code based on the case formulation and FAPRS

This phase ended when coders meeting a moderate kappa's agreement.

2. Feedback Fading: Only "CORRECT" and "INCORRECT" feedback was provided to each coding turn. A change in the training phase happened when coders met a $\kappa=0.75$.
3. No feedback: Coders coded a 10min interval without feedback. Coders finalized the training when meeting a $\kappa=0.75$.

Participants' therapy sessions were timestamped after each floor change by a research assistant blind to the study hypotheses. Coder-1 analyzed Arya's sessions while Coder-2 code Sansa's and Catelyn's sessions. Coders were provided with participants case conceptualizations and a description of global themes addressed in each therapeutic interaction. A week before starting analyzing therapy sessions, coders met with therapists who described participants' presentation and answers questions on their case conceptualizations. After finalizing coding sessions independently, the student investigator assigned thirty percent of sessions of the other coder to each rater with the aim of analyzing reliability. Reliability sessions were randomly ordered and assigned. Cohen's Kappa was interpreted according to Landis and Koch's (1977) standards (Table 7).

Table 7.

Landis and Koch's (1977) kappa interpretation standards.

Kappa Values	Level of agreement
Below 0.00	No Agreement
0.01-0.20	Slight
0.21-0.40	Fair
0.41-0.60	Moderate
0.61-0.80	Substantial
0.81-1.00	Almost Perfect

The utility of Cohen's Kappa as a reliability index for sequential data has been debated by researchers in this area (Wampold & Holloway, 1983). Gardner (1995) pointed out that the Kappa index can fail to measure error in transitional data since it is based on the assessment of simple events (X or Y), but not complex as dyads (X AND Y). He also claimed that Kappa's focus on measuring simple events might hinder the assessment of latent states in transitional data. Bakeman et al. (1997) suggested assessing the reliability of transitional data by performing a sequential statistic such as Yule's Q. They compared Yule's Q to Cohen's Kappa to evaluate transitional data consistency, finding Cohen's kappa was susceptible to the number of codes, variability of simple probabilities, and fallible coders (coders making same mistakes). Rather, Yule's Q remained consistent even though coders assigned inaccurate codes at the same time or events were unlikely. In this order, Yules' Q was included as a supplementary measure of reliability to obtain information of sequences consistency, that is, reliability on the level of the data analyzed (Bakeman at al. 1997). Bakeman et al. (1997) offered the following interpretation for the transition's magnitude: small (0.25), medium. (0.50), and large (0.75).

Instrument Administration and Scoring Procedures. Instruments were administered every session, with the exception of FIAT-Q administered at pre-test, post-test, and follow-up (at the end of intervention). FIAT-Q-SF and DASS were administered at the beginning of each therapy sessions and were filed in a locked cabinet. WAI-SR and FAP-IS were administered at the end of therapeutic encounters. Therapists left participants alone in the room while they completed the WAI-SF and FAP-IS. Participants were instructed to place completed forms in a sealed box. Participants were informed that WAI-SF and FAP-IS were going to be rated after their participation in the study was complete. Such procedures were intended to control for demand characteristics. A blind Research Assistant (RA) scored questionnaires in an Excel worksheet saved in an electronic encrypted file in a locked research laboratory.

Data Analysis

Hypothesis 1: Contingent Reinforcement Functions as the Mechanism of Change in FAP. To examine the mechanisms of change of FAP, a state-base lag sequential analysis was conducted. Lag-sequential analysis is a method that summarizes interactions between behaviors of different individuals with the aim of identifying whether behavioral sequences are cross-dependent (Faraone & Dorfman, 1987). FAPRS' codes were introduced into O'Connor's (1999) sequential-group (SEQGROUPS) syntax in SPSS to analyze lag-sequential data.

Participants' behavioral sequences were summarized in probability transitional matrices. These presented the probability with which the therapist responded contingently given the client emitted a clinically relevant behavior. In mathematical terms, the

probability (P) transitional matrices represent the likelihood with which TCRBs (P TCRB_{st+1}) occur given CRBs' (CRB_{st}) presence at time 1(t+1)

$$P(\text{TCRB}_{st+1} \mid \text{CRB}_{st})$$

Chi-square (χ^2) was performed in an individual lag level to establish whether interdependence (cross-dependence) within the transitional frequency matrices were significant. In the group level, chi-square tested stationarity across behavioral sequences in different sessions within the same phase for each participant. A lack of stationarity among pooled data indicated that behavioral sequences from the same participant at different lags were not significant. Stationarity means that statistical properties (i.e., variances, mean) of a time series remain constant over the time. Because it was predicted that stationarity was going to vary between phases, data were independently pooled for BL and intervention phases.

Statistical significance of transitional probabilities was calculated by computing z-scores (adjusted residuals) (O'Connor, 1999). Yule's Q statistic, that was performed to evaluate the internal consistency of the dyads, also provided information on the magnitude (strength) of the sequential association between clients' and therapists' behaviors. Yule's Q indicates the direction and magnitude of the relation among behaviors and it is interpreted as other association indexes, that is, from -1 to +1 (Lloyd, Kennedy, & Yoder, 2013; O'Connor, 1999). Rosenthal (1996) established the following benchmarks for interpreting Yule's Q effect sizes: small (0.23), moderate (0.43), and large (0.60).

In addition, a bar graph was constructed to analyze the relationship between the DVs (interpersonal difficulties and psychological distress) and the percentage of

contingent reinforcement in the context of a meaningful relationship that was measured by the WAI-SR and the FAP-IS.

Hypothesis 2: A higher proportion of contingent reinforcement delivered by therapist strengthens clients' alternative behaviors. To establish the relation between proportion of reinforcement and changes in clients' interpersonal repertoires in session (Aim 3), TCRBs' proportion were plotted and analyzed regarding changes on contingent reinforcement and clinical outcomes (Manolov, & Moeyaert, 2017).

Hypothesis 3: FAP implementation modifies interpersonal problems and psychological distress in and out of session. Effectiveness of FAP on participants' interpersonal difficulties and psychological distress was examined by conducting descriptive statistics and visual inspection of participants' behaviors to compare trends between-subjects (Manolov, & Moeyaert, 2017). Pustejovsky (2016) web-calculator was employed to analyze between-case standardized mean difference (BC-SMD) (Hedges, Pustejovsky, & Shadish, 2012). Hedges, Pustejovsky, and Shadish (2013) incorporated statistical procedures from between-subjects analysis (Cohen's d) with the aim of summarizing effect sizes on MBL designs. For this aim, they performed a hierarchical model and a Hedges' g (G) correction for small samples. G controlled for biases associated with the number of cases (m), the number of observations (n), and the point in which the intervention is introduced. In addition, they controlled the two following nuisance parameters presented in SCDs: intraclass correlation ($\rho = \rho$) and autocorrelation ($\phi = \Phi$). Therefore, G for SCDs compares changes in the level of

outcome variables between phases¹ while controlling for nuisance variables, producing a small bias effect size estimator (Hedges et al., 2013)². Because G for SCDs maintains the metric of Cohen's d statistic, it was interpreted based on d standards (Cohen, 1988): small effects (0.2-0.49), medium effects (0.5-0.79), and large effects (0.8-above).

A non-overlap analysis of all pairs (NAP; Parker & Vannest, 2009) was also performed as a complementary assessment of the effect sizes of participants' behaviors. NAP equals the number of pairs that overlap in baseline (phase A) and intervention (phase B) and divide them by the total number of comparisons. The percent of non-overlapping data provides an effect size indicator by comparing whether data drawn at random from the baseline exceeds data in treatment. Pustejovsky' and Swan' (2018) web calculator was utilized to compute NAP index. Parker and Vannest (2009) provided following standards to interpret NAP effect sizes based on analysis performed with simple phase change and complex phase SCDs: weak (0–0.65), medium (0.66–0.92), and large (0.93–1.0). However, Petersen-Brown, Karich, and Symons (2012) noted NAP cutoffs were higher in MBL designs compared to other SCDs, suggesting more conservative parameters to interpret NAP. Petersen-Brown's (2012) proposed small effects ranged from 0 to 0.93, moderate effects would range from 0.94 to 0.95, and large

¹ Baseline in within-subjects designs is equivalent to control group data while intervention phase is equivalent to treatment group data in between-subjects designs. Based on that, standardized effect sizes in SCDs are partially explained by the difference on average responses at treatment (μ^T) and baseline (μ^B) (Hedges et al., 2012; Hedges et al., 2013).

² Because statistical analysis for SCDs are relatively new, effects of controlling nuisance parameters on effect sizes remain inconclusive. Hedges' et al (2013) analyzed those effects using simulated and estimated ρ and Φ . They found Hedges' correction overcorrected the effect size value and its variance when ρ and Φ were simulated. When nuisance parameters were estimated from data, a compensated bias lessens the negative effects of Hedges' correction on the effect size. However, its variance tends to underestimate true variance. This latter would increase the weight of the study in meta-analytical studies. Based on that, Hedges et al. (2013) recommended report estimated values of ρ and Φ and effect size's variance to enhance the accuracy of the data analysis.

effects ranged from 0.96 to 1. These latter standards were followed to interpret NAP in this study.

Simulation Modelling Analyses (SMA) were also conducted to establish the relation between FAP and changes in interpersonal difficulties. SMA is an alternative statistical technique that controls for Type-I and Type-II errors when analyzing short streams of autocorrelated data, that are typically observed in single case designs (Borckardt & Nash, 2014). This statistical method simulates datasets similar on length and autocorrelation to the data at hand. Using a bootstrapping, SMA tests if the relationship between the intervention and the dependent variable remains when estimated autocorrelation (Φ) and data length are similar in thousands (~5000) of simulated samples. SMA provides a Pearson's r index and its critical alpha which indicate the correlation between the intervention (IV) and the dependent variable (DV) after simulating data streams. In addition, SMA controlled for effects from baseline trends. That is, a partial correlation of IV and DV with a detrended baseline are provided in the results section.

Results

Results are presented in four main sections. Section one presents coding reliability and descriptive analyses of therapists' (TCRBs) and clients' behaviors (CRBs) in session. Section two addresses lag-sequential analyses and proportions of contingent responding across therapy sessions. Transitional probabilities of TCRB1s given CRB1s and TCRB2s given CRB2s illustrate the mechanism of change in FAP and its effects on outcome variables per participant. Proportions of TCRBs per session were included to establish how contingent responding was related to changes in clinical outcomes. Section three contains analyses of FAP effects on clinical outcomes outside of session as psychological distress and interpersonal difficulties. A between participants comparison of frequency polygons, Simulation Modelling Analysis (SMA), Non-Overlap Analysis of all Pairs (NAP), and between-case standardized mean difference (BC-SMD) were performed. Finally, section four evaluates whether therapeutic alliance and intimacy in the therapeutic relationship moderated clinical outcomes.

Coding Reliability and Descriptive Analysis of Within Session Behaviors

Reliability of sessions, at the level of the data collected, was calculated through Cohen's Kappa (κ). The level of agreement was moderate across participants and sessions (Table 8). Reliability index varied within participants ranging between 0.31 and 0.74 for Arya, 0.48 and 0.59 for Sansa, and 0.34 and 0.74 for Catelyn.

Table 8.

Cohen's Kappa across participants.

Arya				Sansa				Catelyn			
Ss	κ	Level of Agreement	% of agreement	Ss	κ	Level of Agreement	% of agreement	Ss	κ	Level of Agreement	% of agreement
S9	0.49	Moderate	56.9%	S12	0.52	Moderate	60.8%	S4	0.45	Moderate	55.5%
S1	0.31	Fair	39.1%	S7	0.48	Moderate	59.1%	S12	0.74	Substantial	78.6%
S4	0.53	Moderate	60.0%	S9	0.58	Moderate	65.5%	S8	0.65	Substantial	70.7%
S6	0.39	Fair	47.2%	S4	0.59	Moderate	67.6%	S10	0.50	Moderate	59.5%
								S1	0.34	Fair	45.2%
\bar{x}	0.43	Moderate		\bar{x}	0.54	Moderate		\bar{x}	0.54	Moderate	

Reliability, at the level of the data, for CRB1-TCRB1 and CRB2-TCRB2 dyads was analyzed through Yule's Q (Table 9). This statistic allowed to establish the internal consistency of each dyad and discriminate when one or another code was not present in the sequence (0 and N.V. results). Arya's CRB1-TCRB1 and CRB2-TCRB2s dyads showed large internal consistency. Only transitions in S8 and S2 were moderately consistent. Yule's Q for CRB1-TCRB1 could not be computed on S2 since TCRB1 were not provided in that session.

Sansa's CRB1-TCRB1 dyad was largely consistent on five of nine intervention sessions. However, Yule's Q could not be performed for the other nine research session since TCRB1 were not present at those encounters. On the CRB2-TCRB2 analysis, large consistency was observed among sessions, except for S2 in which no TCRB2 was delivered by the therapist. Finally, Catelyn's CRB1-TCRB1 and CRB2-TCRB2 dyads showed large internal consistency during the intervention phase. However, therapist did not provide TCRBs at baseline and Yule's Q could not be analyzed.

Table 9.

Internal Consistency Analysis: Yule's Q across Sessions and Participants.

Ss	Arya		Sansa		Catelyn	
	CRB1-TCRB1	CRB2-TCRB2	CRB1-TCRB1	CRB2-TCRB2	CRB1-TCRB1	CRB2-TCRB2
S1	1.00	1.00	N.V.	1.0	N.V.	N.V.
S2	0.00	0.50	N.V.	1.0	N.V.	N.V.
S3	1.00	1.00	N.V.	1.0	N.V.	N.V.
S4	1.00	1.00	N.V.	N.V.	N.V.	N.V.
S5	1.00	1.00	N.V.	1.0	N.V.	N.V.
S6	1.00	1.00	N.V.	1.0	N.V.	N.V.
S7	1.00	1.00	N.V.	1.0	1.00	1.00
S8	0.50	0.56	1.00	0.97	1.00	1.00
S9	1.00	1.00	1.00	1.00	1.00	1.00
S10	1.00	1.00	0.94	1.00	1.00	1.00
S11	1.00	1.00	1.00	1.00	1.00	1.00
S12	1.00	1.00	1.00	1.00	1.00	1.00
S13			N.V.	0.95	1.00	1.00
S14			N.V.	1.0	1.00	1.00
S15					1.00	1.00

Ss= Sessions

N.V. = No Value

Frequency of all FAPRS codes are presented on Appendix F. Analysis will be focused on behavioral improvements (CRB2s), problematic behaviors (CRB1s), positive reinforcement delivery (TCRB2s), and differential reinforcement administration (TCRB1s). When comparing FAP and BL, CRB2s increased on average at intervention (Table 10). Although Arya's and Sansa's CRB1s reached frequencies close to zero by the end of treatment, Catelyn's problems in session maintained a similar unstable pattern across research phases.

Table 10.

CRBs' and TCRBs' frequency mean (M) and standard deviation (SD) per research phase.

	Arya				Sansa				Catelyn			
	Baseline		FAP		Baseline		FAP		Baseline		FAP	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
CRB1	7.3	4.5	8.0	7.5	3.2	2.2	5.2	5.9	23.7	8.2	14.6	5.9
CRB2	13.6	12.0	19.1	6.9	23.0	7.5	30.8	9.2	3.3	2.5	20.8	5.6
TCRB1	1.3	1.1	6.8	6.7	0.0	0.0	1.2	1.3	0.0	0.0	3.4	1.5
TCRB2	4.0	3.6	9.4	3.6	1.4	1.1	10.9	2.5	0.0	0.0	7.3	3.1

Results did not indicate a negative association between CRB1s and CRB2s; that is, an increase in clients' improvements did not correlate with a reduction of CRB1s in the same session across participants. Visual inspection of clients' and therapists' behaviors in session reveals a lower number of TCRBs by CRBs. A comparison of positive reinforcement (TCRB2s) and clients' improvements showed that TCRB2s were present only half of the time that CRB2s occurred during the intervention (Table 10). A different phenomenon was observed regarding therapists' implementation of differential reinforcement in session (TCRB1s). For instances, a visual analysis of Arya's codes showed a positive relationship between her CRB1s and her therapists' TCRB1s. Sansa's CRB1s increased during intervention which correlated with an augment of TCRB1s' administration by her therapists. Although Sansa's problems in session worsen at S8 and S9, data show a positive effect of TCRB1s, reducing CRB1s to zero by the last session of intervention (Figure 2).

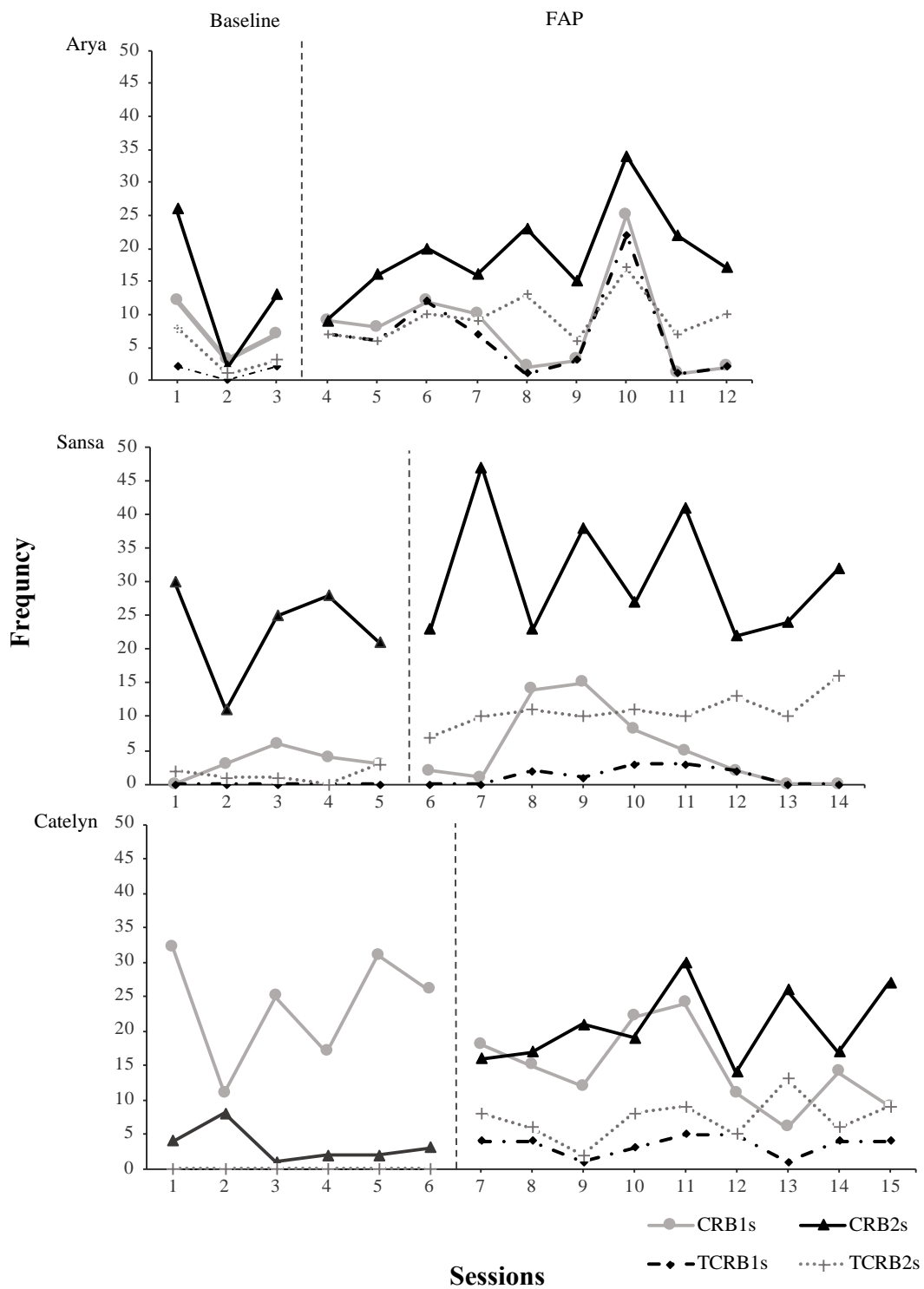


Figure 2. Frequency of CRBs and TCRBs across participants.

Mechanism of Change: Lag-Sequential Analyses and Proportion of Contingent Responding

Clients (CRBs) and therapists (TCRBs) behaviors in-session were examined at a Lag 1, evaluating the probability with which the antecedent event (CRB) predicted the subsequent event (TCRB). Transitional probabilities matrices of all FAPRS codes are presented in Appendix G. Tests of stationarity of pooled data within phases indicated not stationarity among participants (Table 11, Table 12, Table 13), meaning that variance and mean of time series did vary within BL and FAP sessions. Based on these results, transitional probabilities were not pooled per phase.

Analyses of the mechanism of change for each participant are described below. Percentage of transitional probabilities are presented in histograms. Polygons of frequency/scores of outcome variable (CRBs, DASS-42, and FIAT-Q-SF) are compared to transitional probabilities histograms to examine the relation of contingent responding and clinical outcomes. DASS-42 and FIAT-Q-SF were administered before starting the therapy session, therefore, X-axes of these measurements start at S0 for all participants. Proportions of TCRBs histograms are also included in these graphics to identify whether the amount of contingent reinforcement is related to therapeutic change.

Arya: Analyses of Mechanisms of Change. Arya's sessions (S) showed cross-dependence among transitional frequency matrices, indicating a significant interdependence among therapist's and participant's behaviors throughout research phases (Table 11). Across sessions contingent responding and proportion of TCRB1s and TCRB2s were similar. Visual inspection of transitional probabilities indicated a low level of contingent responding to CRB1s in BL. A significant increase in the probability of

occurrence of TCRB1s, given CRB1s, and proportions of TCRB1s were observed within the FAP condition. Therapist's contingent responding occurred between 50% and 100% of times client's presented problematic behaviors in session. In four of the nine intervention sessions therapist responded contingently 100% of the times to CRB1s (Figure 3). Yule's Q indicates that the magnitude of contingent responding in most sessions were significantly large, except for S8 that presented moderate effect sizes. Transitional probabilities were not significant on S2; therefore, Yule's Q was not interpreted for this session (Table 11).

Proportions of TCRB2s and transitional probabilities between CRB2s and TCRB2s were higher than TCRB1s in BL. In the intervention phase, proportions of TCRB2s were lower than TCRB1s, and the likelihood of occurrence of contingent responding to CRB2s was also less than contingent responding to CRB1s. The probability of TCRB2s, given CRB2s, ranged between 31% and 78%, and contingently responding above 50% were observed in five out of nine FAP session (Figure 4). The magnitude of the sequential association between CRB2s and TCRB2s was large for ten of the twelve therapy session, indicating a moderate effect size during S2 and S8 (Table 11).

Table 11.

Arya's transitional probabilities of TCRBs given CRBs and Yule's Q.

Ss	P (TCRB1 _{S_{t+1}} CRB1 _{S_t}) ^a	Yule's Q	P (TCRB2 _{S_{t+1}} CRB2 _{S_t}) ^b	Yule's Q	χ^2	
					Inter-dependence	Stationarity BL FAP
1	0.17*	1.00	0.31*	1.00	270.8*	73.4 229.5
2	0.00	0.00	0.50*	0.50	149.3*	
3	0.29*	1.00	0.23*	1.00	180.9*	
4	0.78*	1.00	0.78*	1.00	217.4*	
5	0.75*	1.00	0.38*	1.00	282.7*	
6	1.00*	1.00	0.5*	1.00	326.7*	
7	0.7*	1.00	0.56*	1.00	214.7*	
8	0.5*	0.50	0.56*	0.56	190.3*	
9	1.00*	1.00	0.4*	1.00	220*	
10	0.88*	1.00	0.55*	1.00	442.9*	
11	1.00*	1.00	0.31*	1.00	202.6*	
12	1.00*	1.00	0.58*	1.00	168.7*	

Ss= Sessions

* $p < .05$

^a Probability of a TCRB1, Given a CRB1.

^b Probability of a TCRB2, Given a CRB2.

Contingent responding to CRB1s by the therapist on outcome variables was significantly associated with a reduction in CRB1s, psychological distress, and interpersonal difficulties (Figure 3). For instance, DASS-42 scores significantly decreased when therapist contingently responded (above 88% of times) in S6, S9, S10, and S11. It is also notable that the proportion of reinforcement in those sessions was above 80%, indicating that the therapist's redirection of problematic behaviors in session impacted Arya's psychological distress positively. Similarly, FIAT-Q-SF scores lessened as a result of the contingent implementation of TCRB1s, particularly in S10 and S11. CRB1s took more time to decrease than DASS-42 and FIAT-Q-SF scores. However, after

a highly contingent session (S6) in the FAP phase, CRB1s were significantly reduced and maintained a lower frequency most sessions until the end of the intervention.

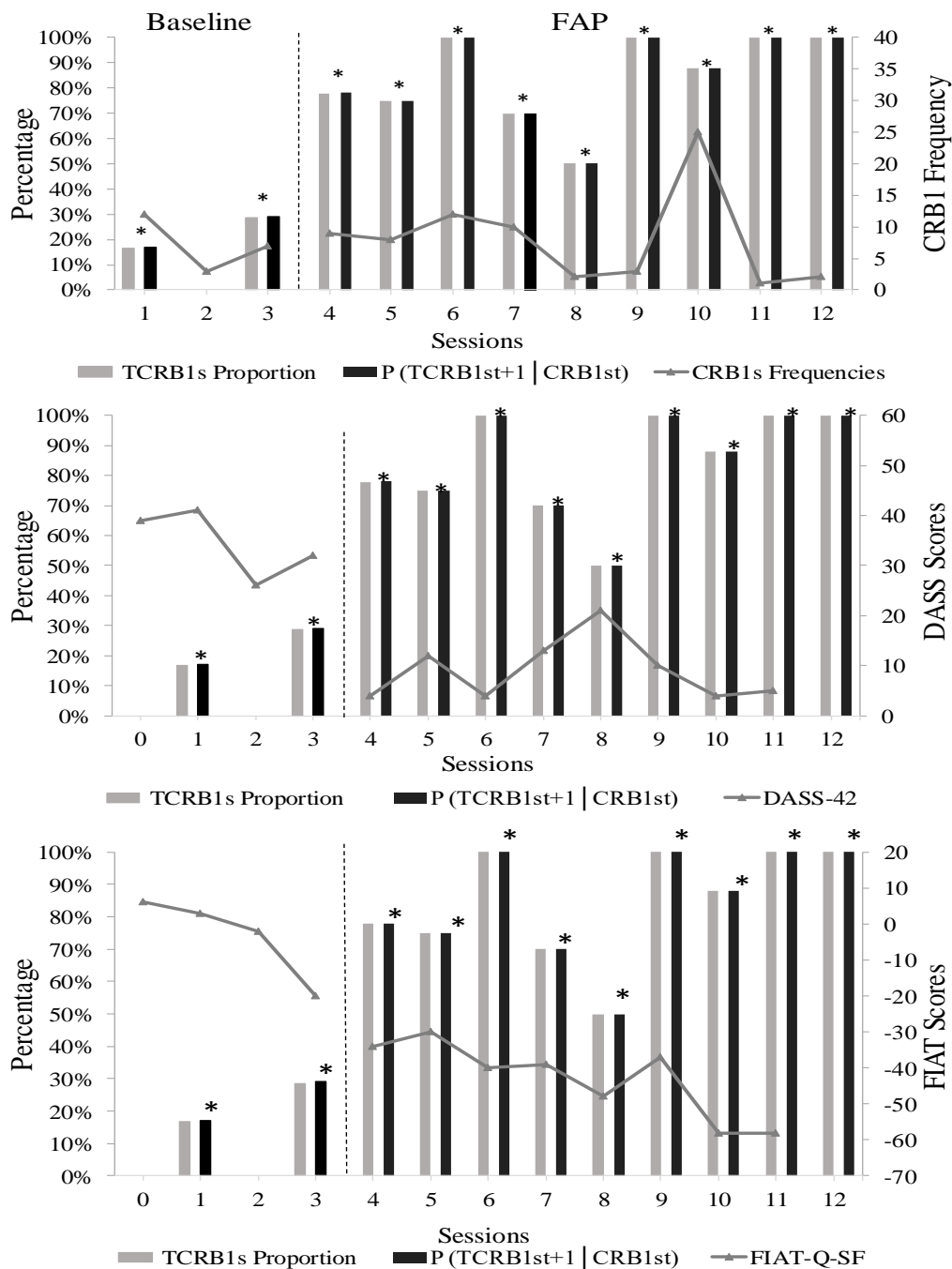


Figure 3. Arya’s TCRB1s, given CRB1s and TCRB1s proportions (left Y-axis) compared to clinical outcomes (right Y-axis). (*) probabilities statistically significant.

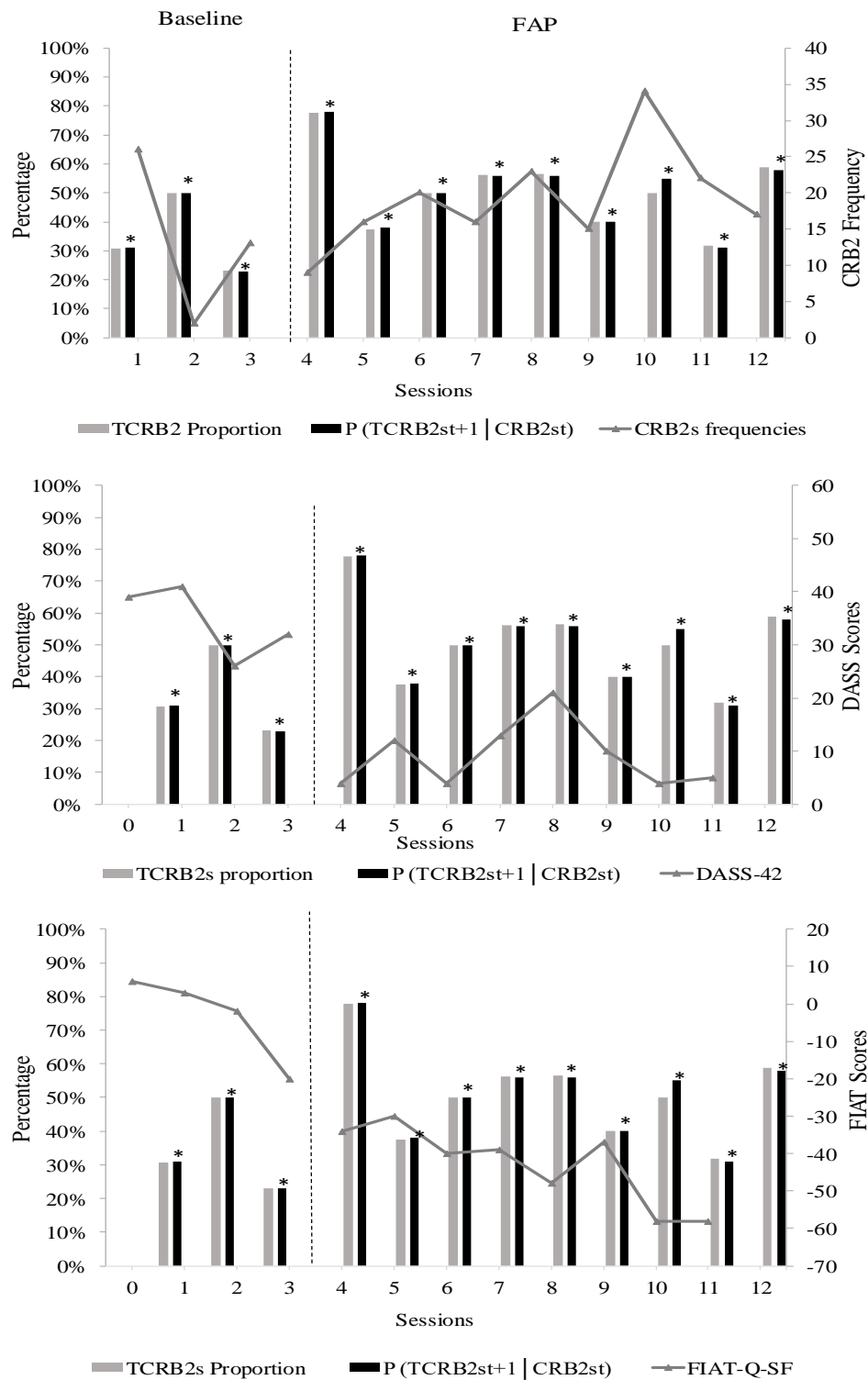


Figure 4. Arya's TCRB2s, given CRB2s and TCRB2s proportions (left Y-axis) compared to clinical outcomes (right Y-axis). (*) probabilities statistically significant

In Arya's case, TCRB2s' proportions were lower than TCRB1s' proportions in the intervention. Outcomes showed that the therapist only responded with positive reinforcement 50% of times a CRB2 occurred. Although CRB2s increased in FAP phase, improvements in session did not change on level or trend. It is important to mention that S4 was the only session in which contingent positive reinforcement reached a probability of 78%; however, it was not related to an improvement in CRB2s frequency. In addition, no other FAP session exceeded 60% of contingent responding which likely may account for why CRB2's did not vary significantly throughout this phase. Similarly, no relationship was observed between psychological distress, interpersonal dysfunction, and therapist's delivery of positive reinforcement (TCRB2s).

Arya's outcomes showed a reduction in clinical problems such as psychological distress and interpersonal dysfunction in and out of session. It is likely a higher rate of contingent responding to CRB1s within the FAP phase produced significant clinical change. A small proportion of contingent administration of positive reinforcement was observed. Therefore, it is not possible to establish how the small amount of TCRB2s affected out of session clinical outcomes (DASS and FIAT-Q scores). It is possible that the low levels of TCRB2s hinder client's opportunities to display CRB2s outside of session, that is, it may reduce chances of generalization. However, TCRB2s low occurrence did not alter the likelihood of improvements in session.

Sansa: Analyses of Mechanisms of Change. Most transitional frequency matrices were significantly cross-dependent (Table 12). However, no significant interdependence between therapist's and Sansa's behaviors was found in S2 (χ^2 (121)

=121.17, $p = 0.47$) and S6 ($\chi^2(121) = 133.9, p = 0.198$); therefore, results of transitional probabilities from these could not be interpreted.

Within BL, therapist did not respond to CRB1s (TCRB1s) indicating compliance with the control condition instructions. Contingent responding to CRB1s were also absent at S6, S7, S13, and S14 during the intervention (Figure 5). Based on that, TCRB1s proportions and transitional probabilities were not calculated for those sessions. Therapist provided TCRB2s less than the 15% of times CRB2s occurred at BL. Proportions of TCRB2s were double during FAP in which therapist provided an average of 34% of TCRB2s when CRB2s occurred (Figure 6).

Visual inspection of transitional probabilities indicated a low level of contingent responding to CRB1s in the majority of intervention sessions. Five of the nine intervention sessions indicated significant contingent responding to CRB1s and had larger effect sizes (see Yule's Q; Table 12). However, only two of these five-session presented percentages of contingent responding and proportions of TCRB1s above 60%. CRB1s were not present in S14 and S15, which may indicate a positive effect of FAP by the end of the intervention phase (Figure 5).

Proportions of TCRB2s increased on average from BL to FAP intervention. However, only in S12 and S14 did the therapist respond to more than 50% of the CRB2s contingently. Percentage of probabilities of TCRB2s, given CRB2s, indicated a low administration of contingent positive reinforcement in most sessions at intervention (Table 12).

Table 12.

Sansa's transitional probabilities of TCRBs given CRBs and Yule's Q.

Ss	P(TCRB1 _{S_t+1} CRB1 _{S_t)^a}	Yule's Q	P(TCRB2 _{S_t+1} CRB2 _{S_t)^b}	Yule's Q	χ^2		
					Inter- dependence	Stationarity BL FAP	
1	N.V.	N.V.	0.07*	1.00	155.9*	78.6	229
2	0.00	N.V.	0.09	1.00	121.1		
3	0.00	N.V.	0.04*	1.00	249*		
4	0.00	N.V.	0.00	N.V.	176.4*		
5	0.00	N.V.	0.14*	1.00	177.5*		
6	0.00	N.V.	0.3	1.00	133.9		
7	0.00	N.V.	0.21*	1.00	219.7*		
8	0.14*	1.00	0.44*	0.97	219.2*		
9	0.07*	1.00	0.26*	1.00	256.8*		
10	0.25*	0.94	0.4*	1.00	213*		
11	0.6*	1.00	0.24*	1.00	232.1*		
12	1.00*	1.00	0.59*	1.00	218.9*		
13	N.V.	N.V.	0.37*	0.95	179.5*		
14	N.V.	N.V.	0.50*	1.00	153.2*		

Ss= Sessions; N.V. = No Values

* $p < .05$

^aProbability of a TCRB1, Given a CRB1.

^bProbability of a TCRB2, Given a CRB2.

A comparison of TCRB1s and TCRB2s showed that positive reinforcement was implemented more frequently than redirection (differential reinforcement). Contrary to expectations, CRB2s' frequencies increased when TCRB2s decreased. However, psychological distress or interpersonal difficulties were not affected by this pattern outside of session.

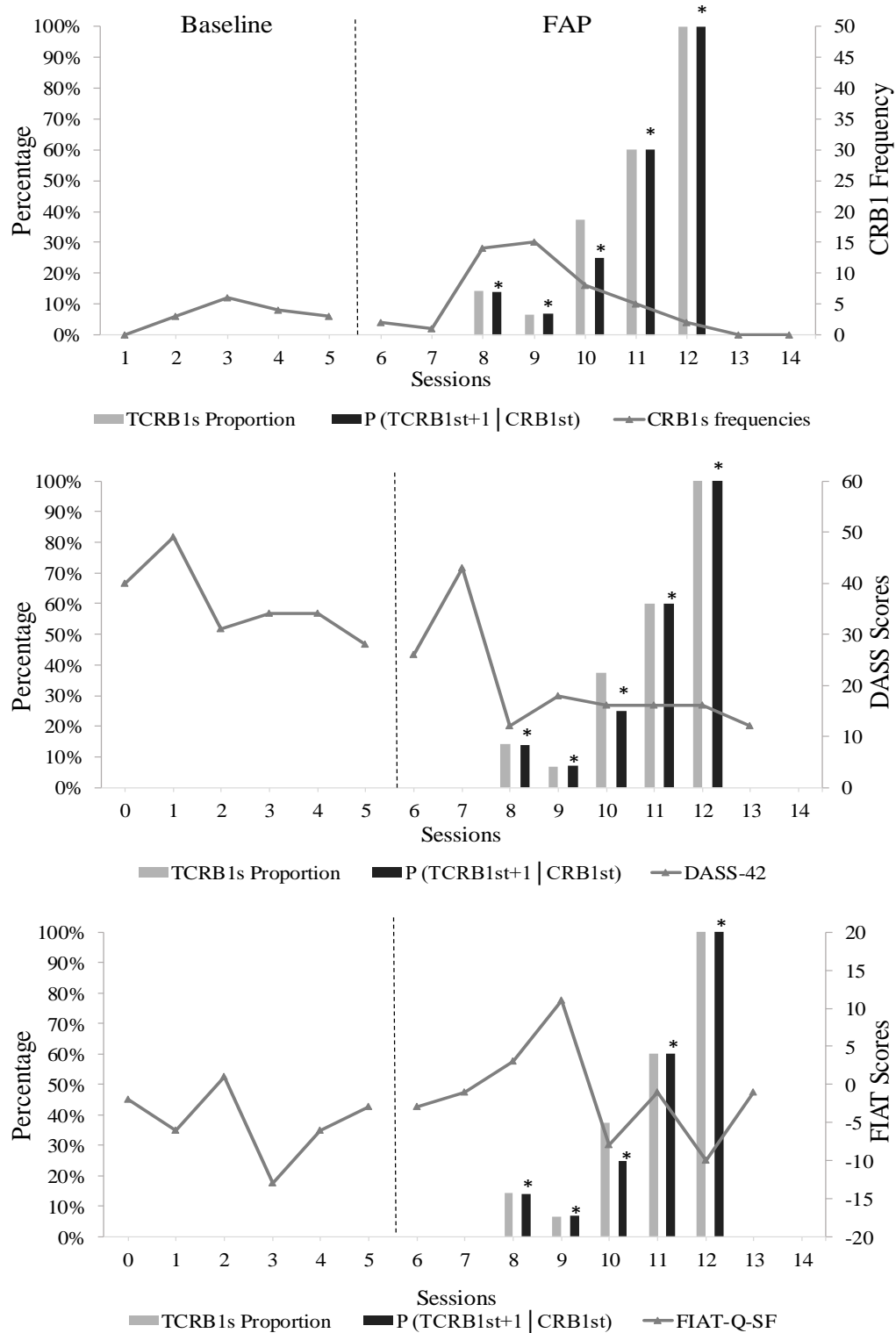


Figure 5. Sansa's TCRB1s, given CRB1s and TCRB1s proportions (left Y-axis) compared to clinical outcomes (right Y-axis). (*) probabilities statistically significant.

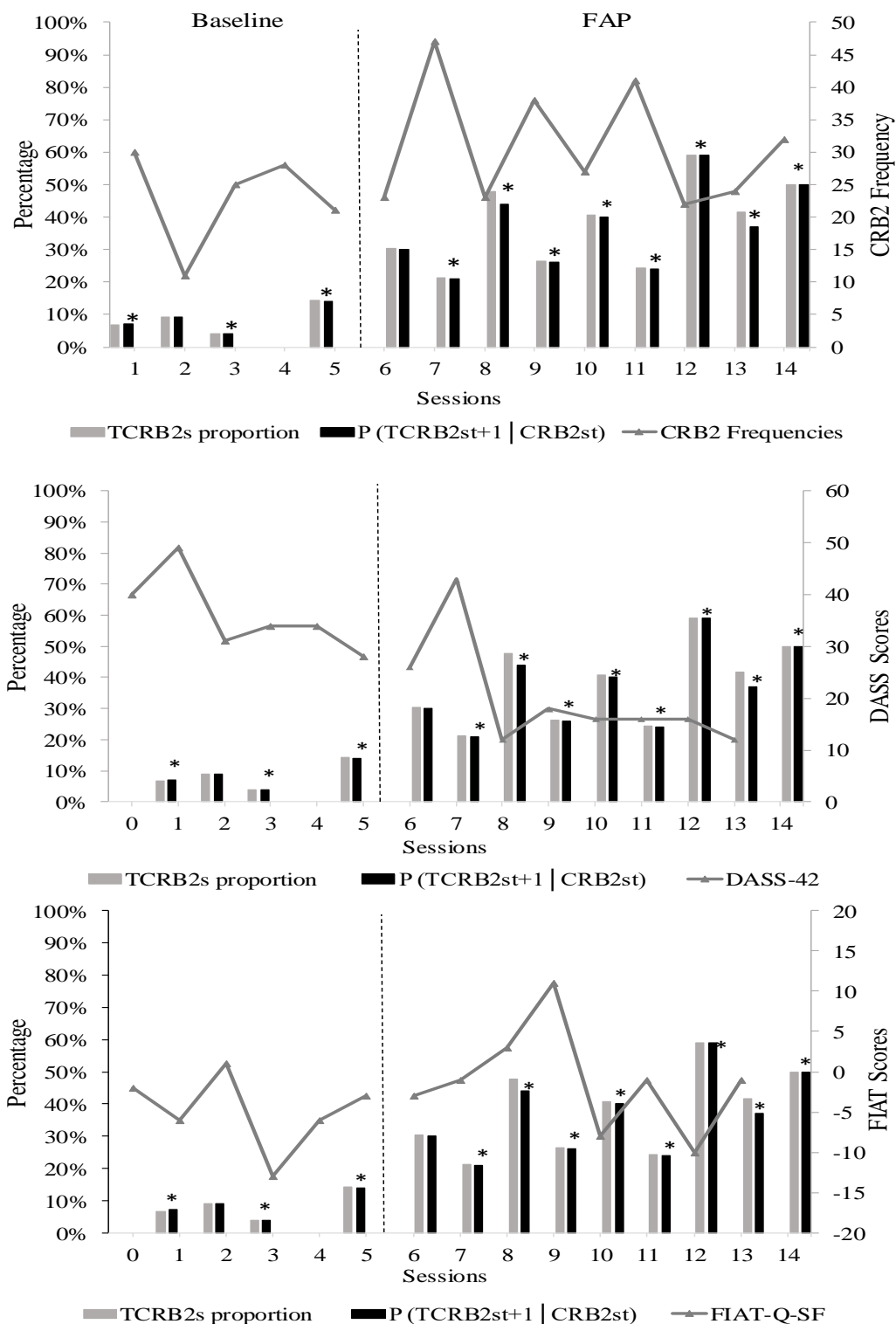


Figure 6. Sansa's TCRB2s, given CRB2s and TCRB2s proportions (left Y-axis) compared to clinical outcomes (right Y-axis). (*) probabilities statistically significant.

TCRB1s' absence in four of FAP sessions limited the analysis of contingent responding to problematic behaviors in and out of session. However, CRB1s displayed an interesting pattern. When the therapist introduced TCRB1s at S8, CRB1s increased in level substantially. Analyzing the effects of increasing TCRB1s proportion and contingent responding, a reduction on CRB1s and DASS-42 scores was observed. Indeed, CRB1s and psychological distress weakened in S10, S11, and S12 when the percentage of contingent responding improved. These results may exemplify the positive effects of evoking and contingently responding to problematic behaviors in sessions to reduce problems outside of session.

Although FIAT-Q-SF scores stabilized in level after increasing the proportion and contingent implementation of TCRB1s, the small amount of contingent responding to CRB1s and CRB2s may have prevented FAP from producing a meaningful change in Sansa's interpersonal difficulties.

Catelyn: Analyses of Mechanisms of Change. Only the transitional frequency matrix in S1 was significantly cross-dependent ($\chi^2(121) = 178.51, p = 0.001$) during BL. Therefore, transitional probabilities of S2, S3, S4, S5, and S6 are not part of this analysis. Instead, FAP phase transitional frequency matrices were significantly interdependent and appropriate to be interpreted (Table 13).

TCRB1s and TCRB2s were not presented at BL as expected. Although contingent responding to problems and improvements was introduced in the intervention, TCRB1s and TCRB2s were implemented less than 50% of times CRB1s and CRB2s occurred (Figure 7, 8). Contingent responding probabilities were statistically significant but lower than 50% contingent at intervention (Table 13).

Visual inspection of CRB2s noted a positive change in level after introducing contingent responding. However, CRB2s showed a variable pattern that was unrelated to TCRB2s in the intervention. Similarly, CRB1s presented a large amount of variability and instability, meaning TCRB1 and CRB1s are likely unrelated in the FAP phase (Figure 7).

The comparison of TCRBs' proportions and contingent responding at Lag 1 with psychological distress and interpersonal difficulties measurements did not indicate an association between contingent responding and clinical outcomes (Figure 7, Figure 8). Neither DASS-42 nor FIAT-Q-SF scores showed changes in trend or level after treatment implementation. Catelyn's outcomes suggested that poor contingent responding to CRB1s and CRB2s hindered therapeutic changes in and out of session.

Table 13.

Catelyn's transitional probabilities of TCRBs given CRBs and Yule's Q.

Ss	P(TCRB1 _{s+1} CRB1 _s) ^a	Yule's Q	P(TCRB2 _{s+1} CRB2 _s) ^b	Yule's Q	χ^2		
					Inter- dependence	BL	Stationarity FAP
1	0.00	N.V.	0.00	N.V.	178.5*	67.6	180.8
2	0.00	N.V.	0.00	N.V.	102.6		
3	0.00	N.V.	0.00	N.V.	129		
4	0.00	N.V.	0.00	N.V.	110.7		
5	0.00	N.V.	0.00	N.V.	137.2		
6	0.00	N.V.	0.00	N.V.	137		
7	0.22*	1.00	0.50*	1.00	207.5*		
8	0.27*	1.00	0.35*	1.00	216*		
9	0.08*	1.00	0.09*	1.00	186.6*		
10	0.14*	1.00	0.42*	1.00	259*		
11	0.17*	1.00	0.30*	1.00	289.3*		
12	0.46*	1.00	0.35*	1.00	179.5*		
13	0.17*	1.00	0.50*	1.00	148.2*		
14	0.29*	1.00	0.35*	1.00	180.5*		
15	0.44*	1.00	0.33*	1.00	264.9*		

Ss= Sessions; N.V.= No Values

* $p < .05$

^a Probability of a TCRB1, Given a CRB1.

^b Probability of a TCRB2, Given a CRB2.

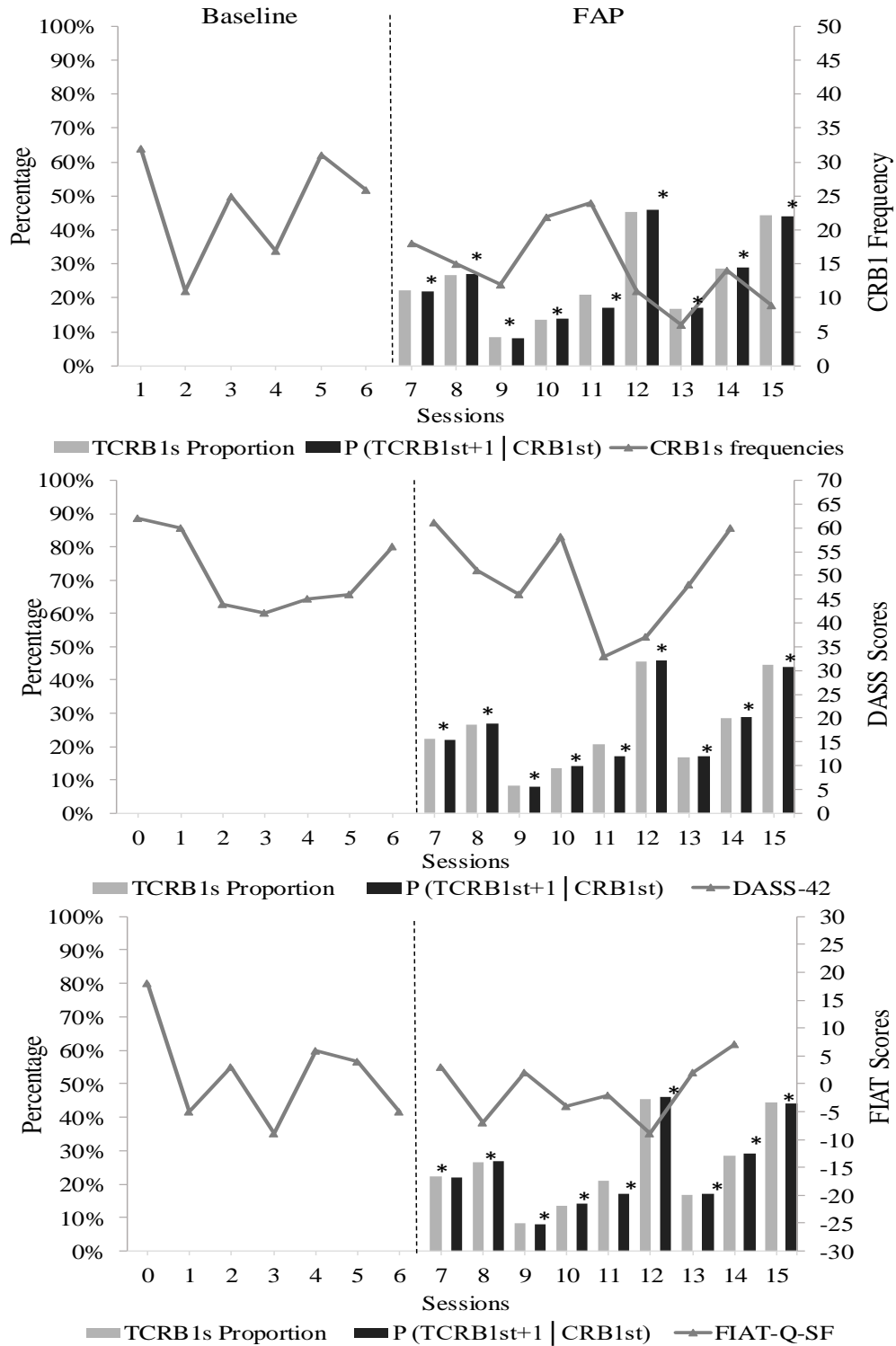


Figure 7. Catelyn’s TCRB1s, given CRB1s and TCRB1s proportions (left Y-axis) compared to clinical outcomes (right Y-axis). (*) probabilities statistically significant.

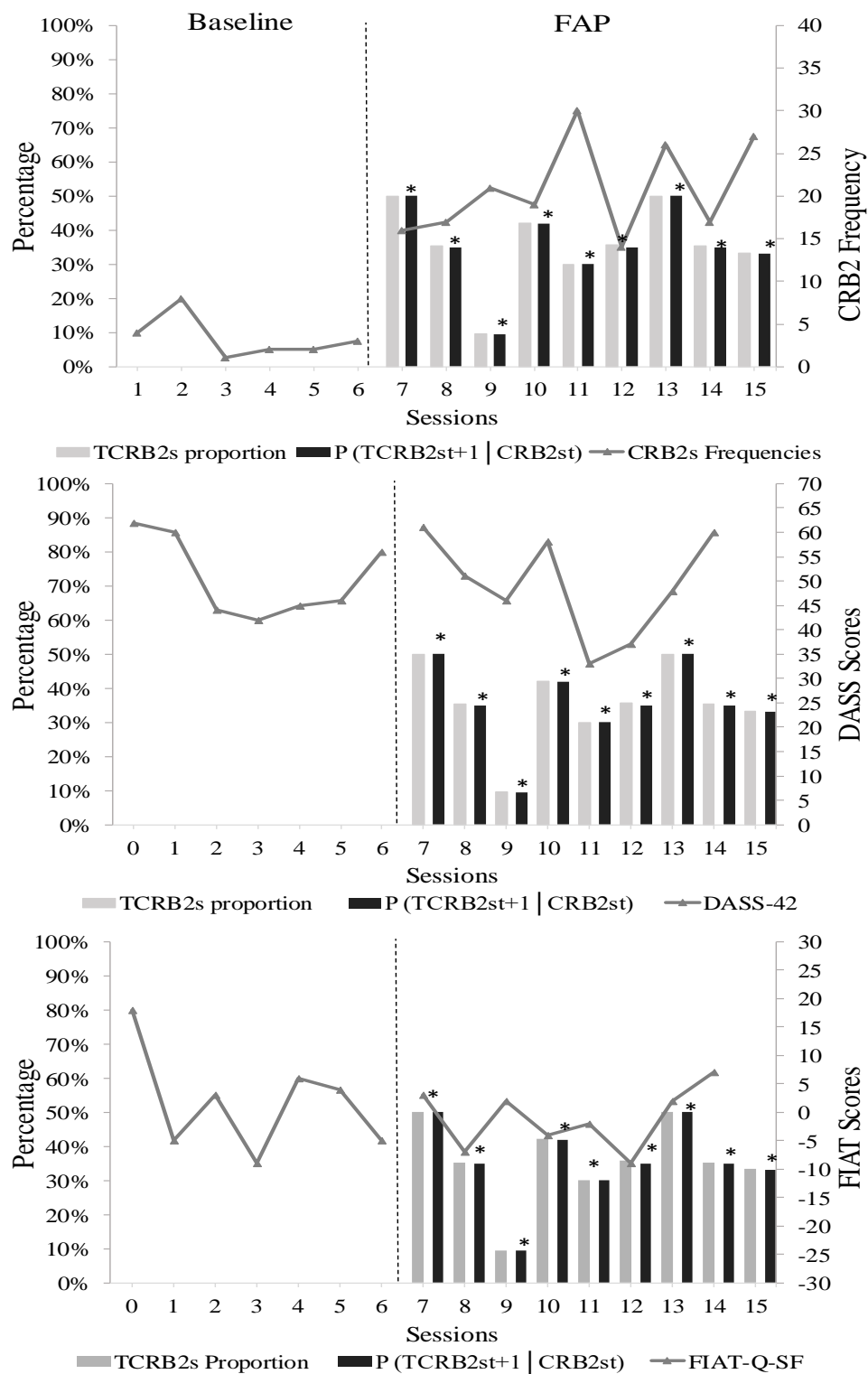


Figure 8. Catelyn's TCRB2s, given CRB2s and TCRB2s proportions (left Y-axis) compared to clinical outcomes (right Y-axis). (*) probabilities statistically significant

FAP and Clinical Outcomes Outside of Session

A report of means (M) and standard deviations (SD) of psychological distress (DASS-42) and interpersonal difficulties (FIAT-Q-SF) measurements at baseline and intervention (FAP) is presented in Table 14.

The DASS-42 has percentiles with the aim of comparing participants scores to a clinical sample and provides ranks of clinical levels of depression, anxiety, and stress (Crawford & Henry, 2003). In the pre-test, Arya reported clinical levels of anxiety (moderate; percentile; 90th), stress (moderate; percentile 93th), and psychological distress (percentile 89th). Although she endorsed levels of depression on the *normal* rank, her average score was on the 70th percentile, indicating her scores were above of the 70% of the sample with which the DASS-42 was validated. Sansa indicated severe depression (percentile 95th), mild levels of stress (percentile 82th), normal levels of anxiety (percentile 65th), and high levels of psychological distress (percentile 90th). Catelyn endorsed severe depressive symptoms (percentile 97th), moderate anxiety (percentile 94th), moderate stress (percentile 92th), and high levels of psychological distress (percentile 96th).

Although FIAT-Q and FIAT-Q-SF provided information on participants interpersonal functioning, no percentiles or clinical cut-offs are offered by their developers (Darrow et al., 2014), which limited clinical interpretation of these scores.

Table 14.

DASS-42 and FIAT-Q-SF scores mean (M) and standard deviation (SD) per phase.

	Arya				Sansa				Catelyn			
	Baseline		FAP		Baseline		FAP		Baseline		FAP	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
DASS-42												
<i>Total</i>	34.5	6.9	9.1	6.1	36.0	7.5	19.9	10.3	50.7	8.3	49.3	10.4
<i>Depression</i>	6.7	2.1	2.4	1.7	16.6	4.4	6.9	7.3	20.7	4.0	17.6	2.9
<i>Anxiety</i>	6.7	3.3	0.8	1.2	3.3	0.8	2.4	1.7	12.4	2.8	15.4	3.9
<i>Stress</i>	21.0	3.9	6.0	4.1	16.0	4.2	10.6	2.9	17.8	3.3	16.3	6.3
FIAT-Q-SF												
<i>Total</i>	-3.2	11.6	-43.0	10.6	-4.8	4.8	-1.2	6.5	1.7	9.1	-1.0	5.5
<i>Avoidance of Interpersonal intimacy</i>	0.7	1.5	-9.5	4.8	11.0	1.9	12.9	4.4	6.6	4.4	5.6	1.8
<i>Argumentativeness or Disagreement</i>	-8.7	5.6	-14.8	2.7	-11.0	2.1	-10.1	5.1	-10.2	4.9	-14.3	2.1
<i>Connection and Reciprocity</i>	-5.7	2.1	-11.6	1.1	-11.7	0.5	-9.0	4.1	-0.9	3.5	-3.1	1.2
<i>Conflict Aversion</i>	6.0	1.4	5.0	1.1	5.8	1.7	4.6	1.7	7.4	1.4	7.50	1.1
<i>Emotional Experience and Expression</i>	4.0	3.9	-1.8	1.9	8.5	2.3	6.2	6.2	3.0	1.7	5.9	1.4
<i>Excessive Expressivity</i>	0.5	5.3	-9.8	4.0	-7.5	1.2	-5.8	2.2	-2.1	3.6	-2.1	2.9

Psychological Distress (DASS-42). A between participants analysis was performed to examine FAP effects on psychological distress outside of session. A reduction in psychological distress scores was observed on Arya's and Sansa's, but scores did not change for Catelyn after implementing FAP or at follow-up (Figure 9). The statistical test of the following null hypothesis was performed based on a fixed effect

model: the average effect size of psychological stress and its scales was zero. Treatment effect showed a significant reduction on level of psychological distress ($\beta = -12.63$, S.E. = 0.40, $p = 0.005$) and depression ($\beta = -5.84$, S.E. = 1.87, $p = 0.004$) after introducing FAP (Table 15). Between-Case Standardized Mean Difference (BC-SMD) evidenced significant medium effect sizes on psychological distress and depression (Table 16).

Table 15.

Psychological Distress (DASS-42) Treatment Effect Test (Fixed Effects).

		Value	SE	df	t-value	p-value
Total	Intercept	39.30	9.78	37	4.02	0.001
	Treatment (FAP)	-12.63	4.27	37	-2.96	0.005
Depression	Intercept	14.80	4.37	37	3.39	0.002
	Treatment (FAP)	-5.84	1.87	37	-3.12	0.004
Anxiety	Intercept	7.13	3.87	37	1.84	0.073
	Treatment (FAP)	-0.82	1.31	37	-0.63	0.532
Stress	Intercept	5.26	5.36	37	0.98	0.333
	Treatment (FAP)	-2.04	1.87	37	-1.09	0.282

Table 16.

Between-Case Standardized Mean Difference (BC-SMD) of Psychological Distress (DASS-42).

	Hedges' g (BC-SMD)	SE	95% CI		df	Φ	ρ
			Lower	Upper			
Total	-0.51	0.41	-1.29	-0.01	3.55	0.42	0.70
Depression	-0.53	0.40	-1.31	-0.03	3.64	0.35	0.69
Anxiety	-0.08	0.24	-0.47	0.26	2.92	0.37	0.80
Stress	-0.15	0.26	-0.59	0.21	2.95	0.40	0.79

ρ = Intraclass Correlation; Φ = Autocorrelation

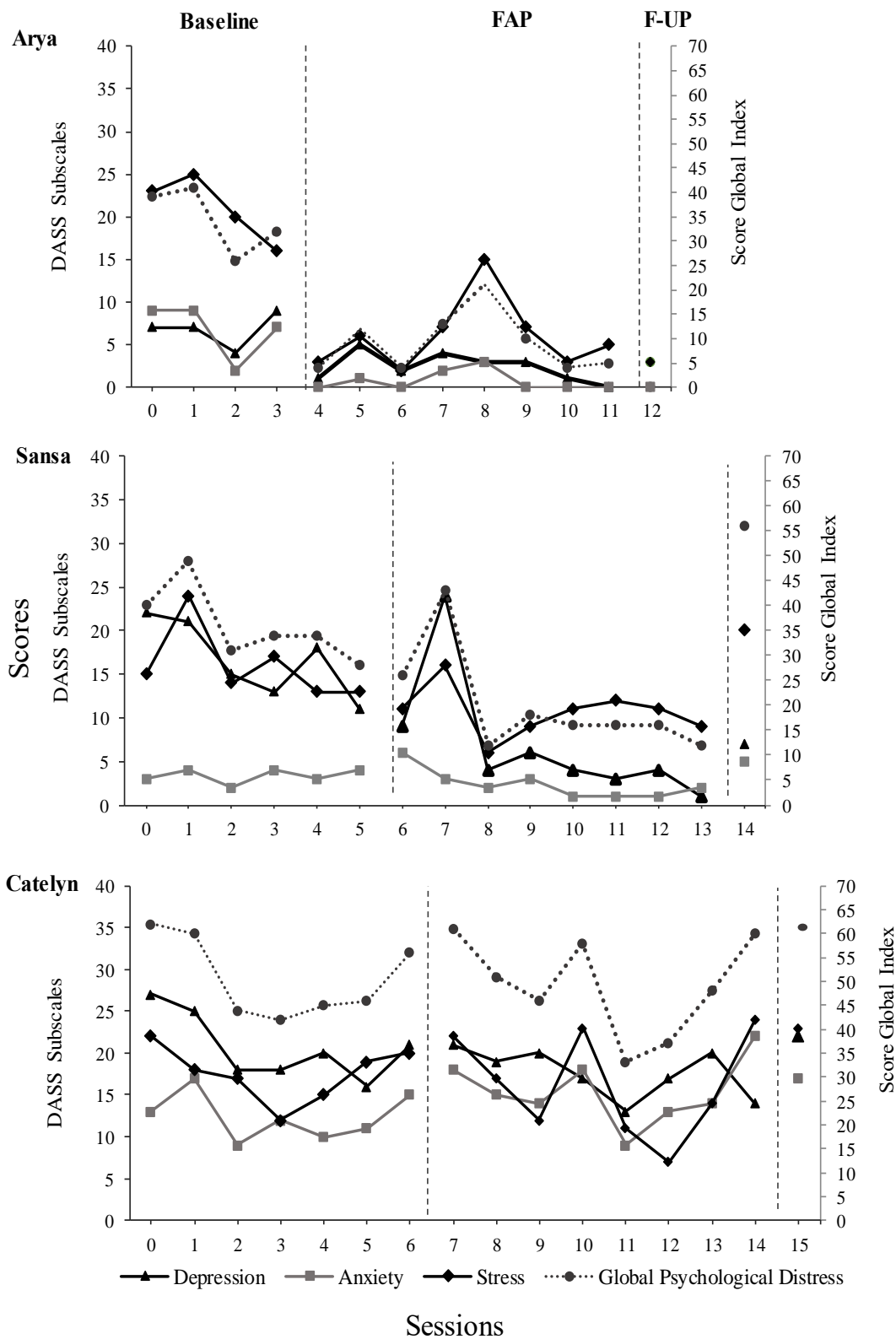


Figure 9. Changes in psychological distress (DASS-42) across participants.

Within participants analyses indicated that Arya's DASS-42 global index and subscales had a positive change associated with FAP implementation, showing a similar trend at the follow-up. Simulation Modeling Analysis (SMA) based on level change confirmed a statistically significant reduction of psychological distress and its subscales for Arya, finding a large negative correlation between the introduction of FAP and DASS-42 scores when controlling for autocorrelation and phase length (Table 17). Non-Overlap Analysis of all Pairs (NAP) results suggested larger effect sizes of FAP on psychological distress subscales, except on depression that showed moderate effects.

Sansa's global index of psychological distress, depression, and stress exhibited a reduction in level when introducing FAP (Figure 9). SMA indicated that changes in stress at intervention were statistically significant, showing a moderate reduction. Nonetheless, stress scale increased significantly at follow-up, negatively impacting psychological distress. Although Sansa's SMA results on global psychological distress and depression were not statistically significant, a trend towards statistically significant effects was found (Table 17). Visual inspection of depression and psychological distress index showed a peak at S8 in psychological distress and depression which likely affected SMA outcomes. Regarding effect sizes, NAP of psychological distress and its subscales show small positive effects. However, stress NAP index had a trend to moderate effects (Table 17).

Contrary to Arya and Sansa, Catelyn's psychological distress presented a high variability across research phases. Introduction of intervention did stabilize or improve DASS global index and its subscales. Rather, anxiety and stress subscales presented a positive trend by the end of the intervention phase, meaning a deterioration on these indicators (Figure 9). SMA did not find a significant relationship between FAP and

DASS-42, which supported observations from the visual analysis. In addition, NAP indicated treatment worsened anxiety (NAP= 0.26, SE= 0.14, CI [0.09-0.55]) and did not produce changes on stress (NAP= 0.56, SE= 0.17, CI [0.29-0.80]) or psychological distress, NAP= 0.45, SE= 0.16, CI [0.22-0.71] (Table 17).

Table 17.

Psychological Distress' (DASS-42) Simulation Modelling Analysis (SMA) and Non-Overlap Analysis of all Pairs (NAP) per Participant.

	Arya				Sansa				Catelyn			
	NAP		SMA ^a		NAP		SMA ^a		NAP		SMA ^a	
	Index	95% CI	<i>r</i>	<i>p</i>	Index	95% CI	<i>r</i>	<i>p</i>	Index	95% CI	<i>r</i>	<i>p</i>
Total	1.00	[1.00, 1.00]	-0.90	0.00	0.87	[0.57, 0.97]	-0.68	0.07	0.45	[0.22, 0.71]	-0.08	0.82
D	0.95	[0.60, 1.00]	0.78	0.00	0.88	[0.56, 0.97]	-0.64	0.08	0.66	[0.38, 0.86]	-0.43	0.22
A	0.96	[0.62, 1.00]	-0.83	0.01	0.69	[0.39, 0.88]	0.35	0.41	0.26	[0.09, 0.55]	0.42	0.11
S	1.00	[1.00, 1.00]	-0.81	0.02	0.92	[0.61, 0.99]	-0.64	0.04	0.56	[0.29, 0.80]	-0.14	0.66

D= Depression; A=Anxiety; S= Stress

a. Test for level change

Interpersonal Difficulties (FIAT-Q and FIAT-Q-SF). A comparison of pretest-posttest of the FIAT-Q showed a positive impact of FAP on Arya' and Sansa' interpersonal functioning (Figure 10). Sansa's interpersonal difficulties returned close to BL during the follow-up, however. FIAT-Q was not administered to Catelyn at the posttest assessment. Nonetheless, Catelyn's interpersonal difficulties did not change significantly from BL to follow-up. A similar pattern of interpersonal difficulties was observed in Sansa' and Catelyn' FIAT-Q-SF total score. Nonetheless, Sansa's FIAT-Q results diverged from FIAT-Q-SF scores. The statistical test of the treatment effect of FIAT-Q-SF and its subscales across participants did not show a significant reduction in

interpersonal dysfunction after implementing FAP (Table 18). Hedges' g as a group effect size statistic was not significant and therefore not interpreted (Table 19).

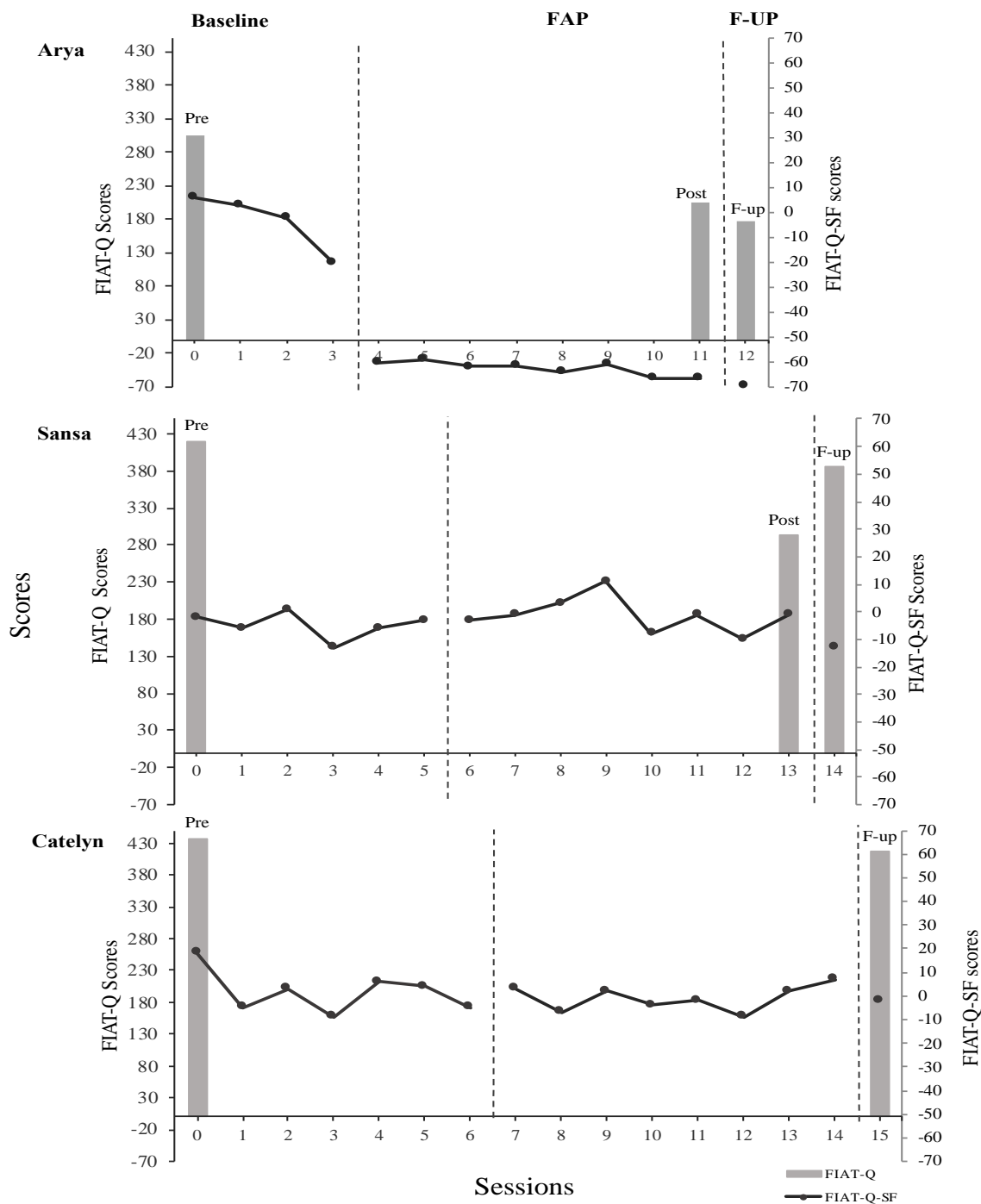


Figure 10. Discrete and continue outcomes of interpersonal difficulties measured by FIAT-Q and FIAT-Q-SF across participants.

Table 18.

Interpersonal Difficulties (FIAT-Q-SF) Treatment Effect Test (Fixed Effects).

		Value	SE	df	t-value	p-value
Total	Intercept	-5.11	10.80	37	-0.47	0.639
	Treatment (FAP)	-3.42	5.81	37	-0.59	0.559
Avoidance of interpersonal intimacy	Intercept	5.26	5.36	37	0.98	0.333
	Treatment (FAP)	-2.04	1.87	37	-1.09	0.282
Argumentativeness or Disagreement	Intercept	-10.27	1.26	37	-8.14	0.001
	Treatment (FAP)	-2.61	1.60	37	-1.64	0.110
Connection and reciprocity	Intercept	-6.23	2.65	37	-2.35	0.024
	Treatment (FAP)	-1.47	1.36	37	-1.08	0.287
Conflict aversion	Intercept	6.38	0.77	37	8.25	0.001
	Treatment (FAP)	-0.67	0.43	37	-1.55	0.130
Emotional Experience and Expression	Intercept	4.63	2.08	37	2.22	0.033
	Treatment (FAP)	-1.23	1.73	37	-0.71	0.483
Excessive Expressivity	Intercept	-3.57	1.86	37	-1.91	0.063
	Treatment (FAP)	-2.00	1.92	37	-1.04	0.306

Table 19.

Between-Case Standardized Mean Difference (BC-SMD) of Interpersonal Difficulties (FIAT-Q-SF)

	Hedges' g (BC-SMD)	SE	95% CI		df	Φ	P
			Lower	Upper			
Total	-0.12	0.28	-0.64	0.36	4.79	0.90	0.00
Avoidance of interpersonal intimacy	-0.15	0.26	-0.59	0.21	2.95	0.40	0.79
Argumentativeness or Disagreement	-0.62	0.40	-1.40	0.15	29.88	0.30	0.00
Connection and reciprocity	-0.23	0.31	-0.80	0.27	4.22	0.47	0.61
Conflict aversion	-0.33	0.26	-0.85	0.14	8.43	-0.03	0.43
Emotional Experience and expression	-0.23	0.37	-0.95	0.46	9.70	0.51	0.27
Excessive Expressivity	-0.39	0.41	-1.19	0.38	15.29	0.53	0.10

ρ = Intraclass Correlation; Φ = Autocorrelation

A within participant analysis of FIAT-Q-SF subscales showed distinct behavioral patterns among interpersonal behaviors across participants (Figure 11). For instance, in Arya's case, a significant correlation between FAP and FIAT-Q-SF total score was observed in the SMA, as well as strong effect sizes on the NAP. Arya's avoidance of intimacy and problems connecting with others showed meaningful positive changes when FAP was implemented. Such outcomes were supported by SMA analyses that demonstrated a significantly strong negative correlation between FAP and Avoidance of Interpersonal Intimacy and Connection and Reciprocity subscales. In addition, NAP aided large effect sizes for these subscales. Difficulties expressing emotions rapidly decreased from the baseline and maintained a lower trend at intervention and follow-up. Although SMA showed a significant correlation between FAP and Emotional Experience and Expression and Excessive Expressivity, these outcomes may be biased by their BL trends. A reduction in difficulties with Argumentativeness and Disagreements was observed after S9; nonetheless, those changes were not supported by SMA and NAP which were not statistically significant. Finally, level and trend of Conflicts Aversion remained stable across research phases; hence, intervention did not produce an impact on this subscale (Table 20).

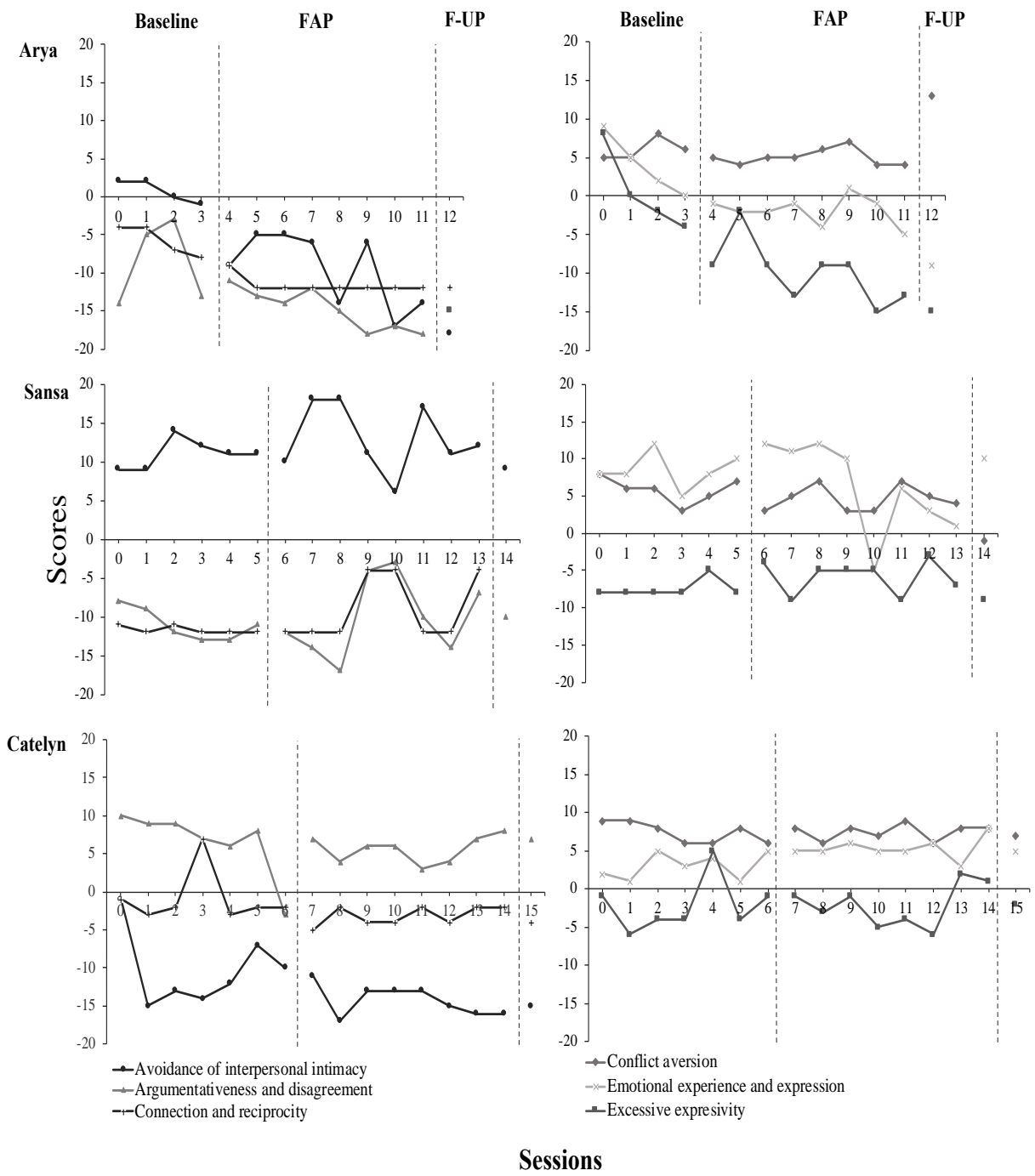


Figure 11. Changes in interpersonal functioning subscales of FIAT-Q-SF across participants.

Table 20.

Interpersonal Difficulties' (FIAT-Q-SF) Simulation Modelling Analysis (SMA) and Non-Overlap Analysis of all Pairs (NAP) per Participant

	Arya				Sansa				Catelyn			
	NAP		SMA ^a		NAP		SMA ^a		NAP		SMA ^a	
	Index	95% CI	<i>r</i>	<i>p</i>	Index	95% CI	<i>r</i>	<i>p</i>	Index	95% CI	<i>r</i>	<i>p</i>
Total	1.00	[1.00, 1.00]	-0.88	0.01	0.39	[0.17, 0.67]	0.31	0.25	0.46	[0.22, 0.72]	-0.19	0.36
Avoidance of Interpersonal Intimacy	1.00	[1.00, 1.00]	-0.79	0.03	0.36	[0.15, 0.66]	0.27	0.34	0.74	[0.44, 0.91]	-0.15	0.60
Argumentativeness or Disagreement	0.81	[0.45, 0.95]	-0.63	0.15	0.49	[0.23, 0.76]	0.11	0.77	0.79	[0.48, 0.93]	-0.50	0.07
Connection and Reciprocity	1.00	[1.00, 1.00]	-0.79	0.03	0.42	[0.18, 0.70]	0.40	0.22	0.75	[0.45, 0.91]	-0.43	0.09
Conflict Aversion	0.73	[0.39, 0.92]	-0.40	0.25	0.70	[0.39, 0.89]	-0.36	0.15	0.50	[0.25, 0.75]	0.03	0.90
Emotional Experience and Expression	0.97	[0.62, 1.00]	-0.75	0.04	0.55	[0.27, 0.80]	-0.24	0.50	0.13	[0.03, 0.43]	0.63	0.01
Excessive Expressivity	0.95	[0.60, 1.00]	-0.77	0.03	0.38	[0.16, 0.67]	0.42	0.03	0.46	[0.22, 0.73]	0.00	1.00

a. Test for level change

Sansa's Emotional Experience and Expression was the only FIAT-Q-SF subscale that decreased after implementing FAP. Changes in emotional experience occurred after S10 and close to the end of intervention, which likely affected SMA and NAP analysis that were not statistically significant. Contrary to expectations, Excessive Expressivity increased upon FAP implementation, showing a significant low correlation and NAP index indicating intervention produced negative effects (Table 20). Other FIAT-Q-SF scales maintained relatively stable trend and level across research phases, meaning intervention did not influence them (Figure 11).

Most Catelyn's FIAT-Q-SF subscales did not vary in trend or level from BL to intervention. However, a negative impact on Excessive Expressivity scales was observed after implementing FAP (Figure 11). A strongly significant positive correlation was found on excessive emotional expression at intervention though NAP did not show effects (NAP= 0.13, SE= 0.09, CI [0.03-0.46]; Table 20). These outcomes indicated that the initiation of the intervention corresponded with a deterioration of Catelyn's emotional expression score.

Therapeutic Relationship Factors and Clinical Outcomes

Working alliance (WAI-SR) and therapeutic relationship intimacy (FAP-IS) between participants had a positive association, that is, participant's evaluation of therapeutic alliance correlated with an intimate therapeutic relationship across research phases. Arya (WAI-SR M=48) and Sansa (WAI-SR M=43) reported high scores in therapeutic alliance at end of BL. Upon FAP implementation, WAI-SR scores were a few points below of its ceiling (60 pts) scores (Arya WAI-SR M=56.3; Sansa WAI-SR M=57.7). Catelyn's therapeutic alliance scores were low across the research process, showing a slight improvement by the end of the intervention. Therapeutic relationship intimacy scores changed on level from BL to FAP for Arya (FAP-IS BL M=54; FAP-IS Intervention M=71.3) and Sansa (FAP-IS BL M =68 FAP-IS Intervention M=83.7). Catelyn's scores on intimacy did not change in level or trend when introducing FAP though scores trend slightly increase by the end intervention (Figure 12).

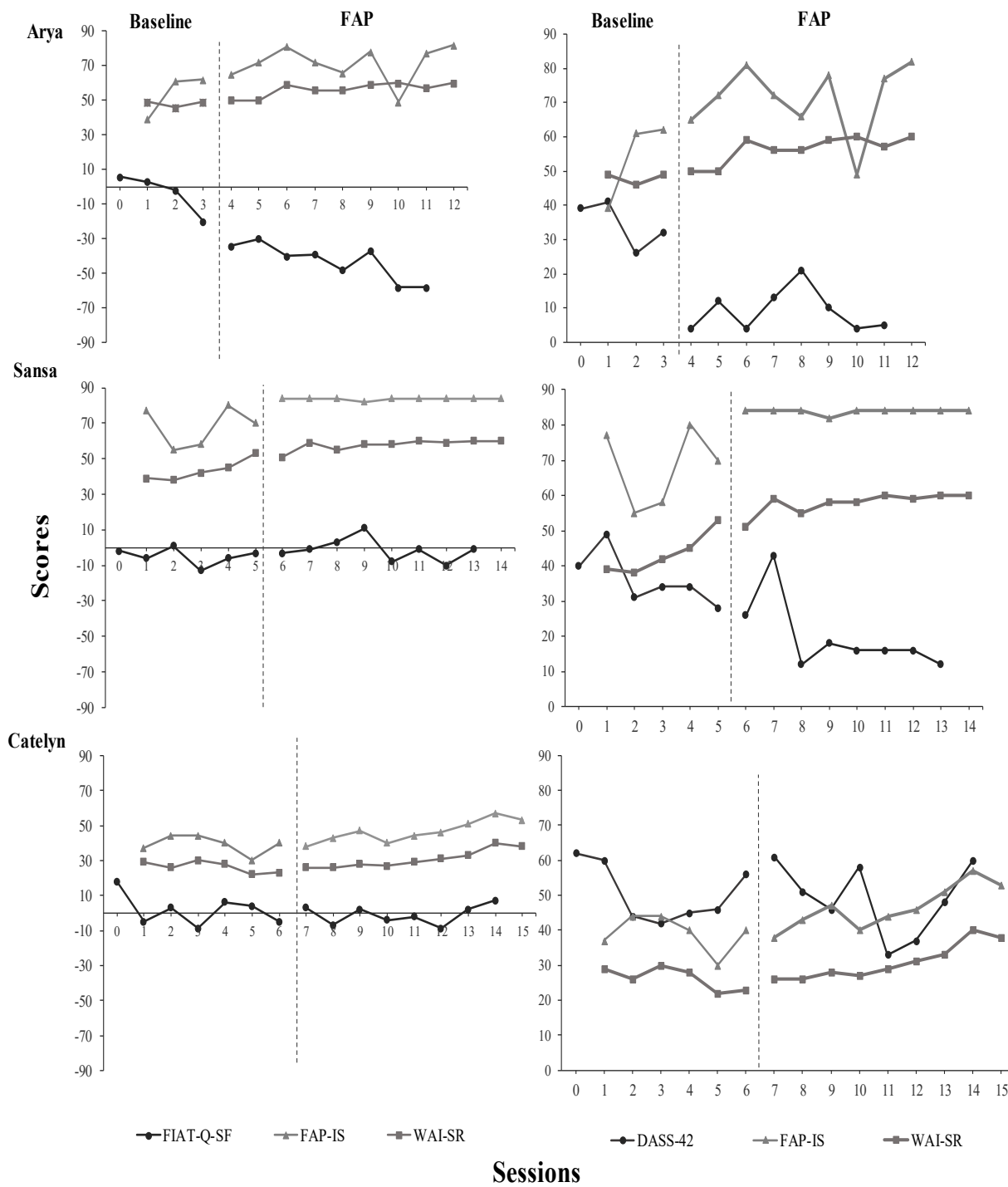


Figure 12. Changes in interpersonal functioning and psychological distress compared to therapeutic relationship measurements.

Independent patterns between clinical outcomes and therapeutic relationship measurements were observed when comparing other scales. For instance, Arya's psychological distress and interpersonal difficulties scores continue improving even though therapeutic alliance measurement reached the top of their rating. In S10, FAP-IS scores were negatively impacted; however, DASS-42 and FIAT-Q-SF seemed not to be altered by such change rather their rates improved. Sansa's responses to WAI-SR and FAP-IS rapidly reached their ceiling in the FAP phase; nonetheless, neither interpersonal difficulties scores changed when therapeutic relationship measurements improved, nor psychological distress measures varied as a result of the changes in working alliance and therapeutic relationship intimacy. Catelyn's therapeutic relationship measurements slightly improved in from S13, but it did not alter the unstable presentation of psychological distress or improve interpersonal difficulties scores (Figure 12).

When comparing therapeutic alliance measurements with contingent responding changes, a slight association between low levels of contingent responding and therapeutic alliance were observed on Arya and Sansa. However, this observation does not apply for all participants and it is worth to explore whether other variables may influence therapeutic relationship (Figure 13).

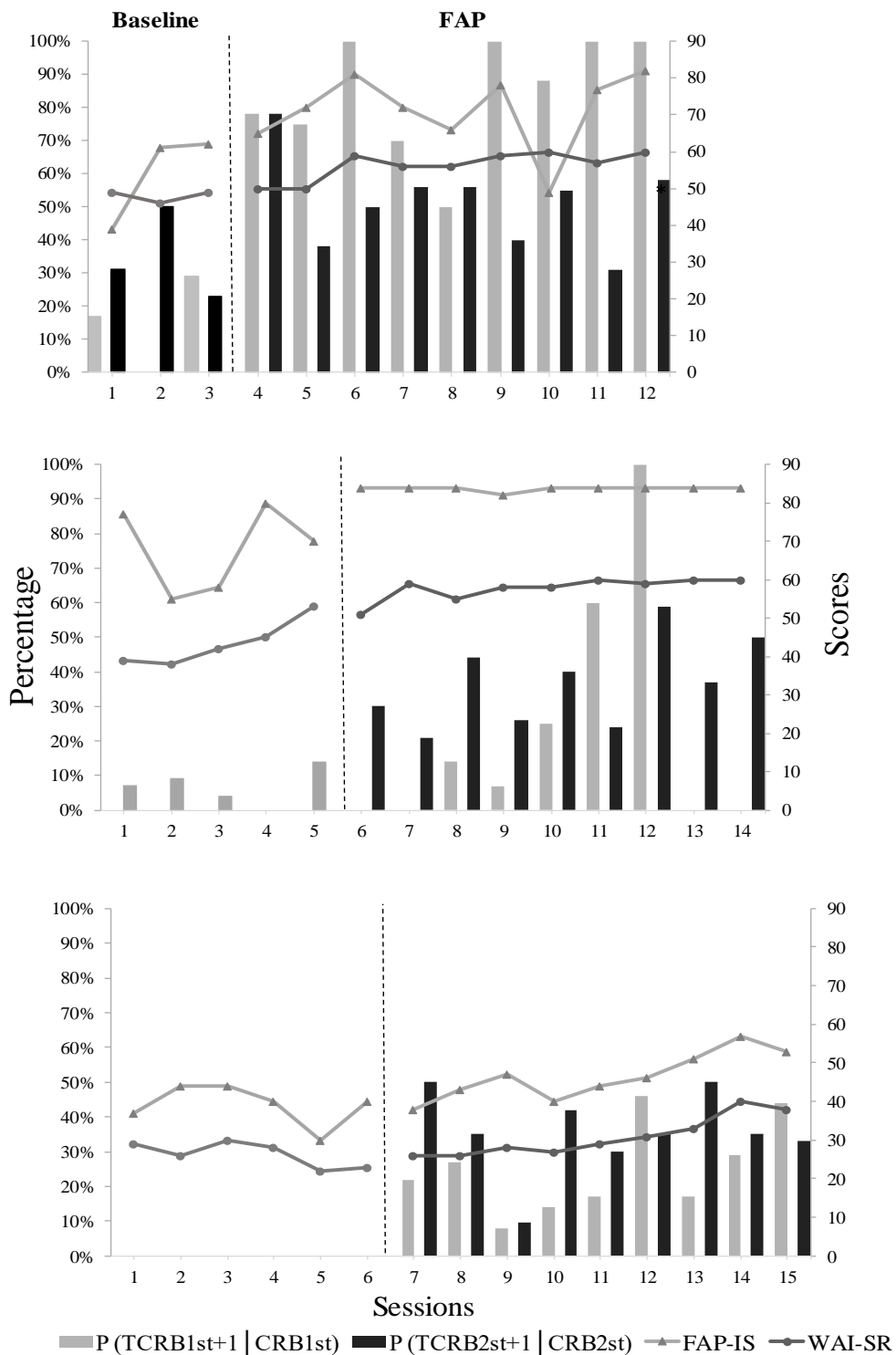


Figure 13. Therapeutic relationship measurements and contingent responding.

Discussion

The main assumption of Functional Analytic Psychotherapy is that clinical change is produced by the action of contingent reinforcement (Kohlenberg & Tsai, 1991). This study provided promising empirical evidence on this assumption. The sequential microanalysis of clients' and therapists' behaviors in session tested the hypothesis of contingent reinforcement as the mechanism of change (MoC) of FAP and allowed formulating potential explanations for why and how treatment outcomes occurred.

Higher rates of contingent reinforcement in the intervention compared to supportive listening (SL; Baseline) were found in a similar way to other FAP studies (e.g., Maitland & Gaynor, 2016). FAP therapists responded to clients' problems (CRB1s) and improvements (CRB2s) in accordance with established learning principles. Random assignment of therapeutic sessions to blind coders aided controlling raters' biases. This methodological control reduced the chances that observations of clinical changes were an artifact of the coding process. Although contingent responding (TCRBs) proportions were higher during intervention than BL, meaningful changes were not observed in all participants. Indeed, differences in psychological distress were found in two participants while interpersonal difficulties decreased only for one of them.

Assessment of proximal and distal dependent variables (CRBs, psychological distress, and interpersonal difficulties) as well as potential moderators (i.e., therapeutic alliance) of the treatment-outcome relationship provided valuable information on FAP's mechanism of change. High rates of contingent differential reinforcement when CRB1s occurred were the main factor associated with treatment effects. But what do high

probabilities of contingent reinforcement mean? This study found that contingent responding above 60% was related to significant changes in clinical indicators (CRBs, psychological distress, and interpersonal difficulties). In Arya's and Sansa's cases, a substantial reduction in psychological distress was observed when high levels of contingent reinforcement were found in some of the FAP sessions. Sansa's interpersonal functioning was not affected by high probabilities of differential reinforcement presented in two of nine therapy sessions. Catelyn's therapist delivered TCRB1s during all intervention sessions. However, contingent reinforcement was introduced less than 50% of times that CRB2s occurred, meaning contingent responding happened with a low probability in Catelyn's sessions. While competing schedules of reinforcement make exact interpretation difficult, this is the first study to provide parametric data on the density of therapist responding needed to produce change.

The clear distinction between procedures and explanatory processes as well as the data analysis strategies in this study aided overcoming problems usually found on process-outcome research (Hofmann & Hayes, 2019). Methodologically, therapists' therapeutic actions, contingencies of reinforcement, and outcome variables were distinguishable. These differences allowed for clarity in the analysis. Examination of therapist-client dyads using lag sequential analysis provided information about the causal link between FAP and clinical outcomes. Information on proximal dependent variables controlled for artifacts associated with long time intervals between therapeutic procedures and clinical outcomes (Boswell, 2015).

This study provided parametric evidence that high levels of contingent reinforcements are fundamental for producing in and out of session clinical changes. These results may explain difficulties finding stable and significant changes in Busch's et al. (2009) study that examined contingent reinforcement effects over CRBs when CBT and FAP interventions were implemented. Busch et al. (2009) found probabilities of contingent responding below 60% when FAP was administered, preventing stable treatment outcomes. While this is a plausible interpretation that aggregates information on the effects of low contingent reinforcement, it should be noted with caution since the FAP phase in Bush et al. (2009) may be affected by carryover effects (a CBT intervention preceded FAP) and thus this conclusion may be inaccurate.

Behavioral momentum was another factor that likely favors treatment outcomes in this research. A greater momentum was observed in Arya's case, in which FAP was characterized by an ongoing high level of reinforcement rate relative to participant's CRBs, enhancing the chances of producing sustainable clinical changes. Instead, Sansa's and Catelyn's contingencies of reinforcement were intermittent and lower in most sessions, interfering with behavioral momentum and enduring change. As Waltz and Follette (2009) stated, some problematic behaviors persisted even though rates of reinforcement were modified. It is likely that Sansa's and Catelyn's low and inconsistent rates of contingent reinforcement (i.e., small behavioral momentum) hindered alternative behaviors chances of competing with participants history of reinforcement.

Statistical analyses tested and synthesized FAP effects on interpersonal problems and psychological distress (Hypothesis 3). Between-Case Standardized Mean Difference

analyses (BC-SMD) demonstrated significant medium effect sizes of FAP on psychological distress and depression. The fact that contingent responding was differentially administered across participants made within-person statistical analyses crucial to test the effects of contingent reinforcement quantitatively. While Arya's simulation modelling analysis confirmed a positive relationship between FAP and treatment outcomes, it did not detect a significant correlation between Sansa's and Catelyn's low rates of contingent reinforcement and interpersonal difficulties. The non-overlap analysis of all pairs found significant strong effects only for reducing interpersonal problems in Arya while negative effects on Catelyn's Emotional Experience and Expression (FIAT-Q-SF' subscale) were related to lower rates of contingent responding. It is also likely that Catelyn's long-standing difficulties to effectively communicate her emotions across contexts affected her engagement in a novel interpersonal stance offered in FAP.

Changes on interpersonal difficulties occurred under conditions of high and consistent rates of contingent reinforcement. Shaping interpersonal behaviors such as emotional expression, needs assertion, conflicts resolution, bidirectional communication, and so forth (Callaghan, 2001) likely requires that the therapist focus on specific repertoires in session. Therefore, low rates of contingent reinforcement were not enough to train alternative interpersonal repertoires. Improvements in interpersonal behaviors were only observed in one client; therefore, replications are needed to determine whether FAP is a valid intervention for social functioning.

Positive effects of FAP on depressive symptoms as measured by the DASS-42 were notable. These outcomes replicated other researchers' findings on the utility of FAP-alone for reducing clinical depression (Landes et al., 2013; Lopez, Ferro, & Valero 2010; Ferro, Valero, & Vives, 2006; Singh, & O'Brien, 2017). Literature in social competence and interpersonal functioning have demonstrated a negative relationship between effective interpersonal repertoires, distress, and depression, which may explain the relationship between FAP and a reduction in depression. For instance, Segrin (2000) found a consistent relationship between interpersonal deficits and depression, which led to the hypothesis that improvements in social competence can reduce depressive behaviors. Herzberg et al. (1998) found that individuals who engage in socially competent behaviors, particularly expressing emotional support, reported lower levels of distress. It is likely that contingent differential reinforcement aids participants in contacting social sources of reinforcement which are a mediator of treatment effects for depression (Solomonov, in press). Future research can explore whether the natural, high-quality social reinforcement provided in FAP is responsible for changes in depression and distress.

Moderation effects of therapeutic relationship factors such as working alliance and intimate therapeutic relationship were not detected in this study. In fact, therapeutic relationship factors were highly rated by Arya and Sansa from the first session of BL. When therapeutic intimacy decreased, neither psychological distress nor interpersonal difficulties were impacted. However, it is noted that Catelyn's therapeutic relationship factors were rated low over research phases and she did not report improvements in

clinical outcomes. Some possible explanations for between-participants differences include:

1. Ceiling effects: therapeutic relationship instruments may present ceiling effects, particularly the WAI-SR, whose scores reached maximum ratings by the end of BL. This may produce inaccurate information on working alliance relevance for treatment outcomes on two of the three participants (Taylor, 2010)
2. Therapist effects: high scores on therapeutic alliance and intimacy from first therapeutic interaction may relate to therapist features such as gender, age, marital status, political views, etc., that matched participants' preferences and may favor therapeutic relationship. This also would explain no changes observed on Catelyn who differed on age, gender, and marital status from her therapist. As DeRubeis, Brotman, and Gibbons (2005) mentioned, a good client-therapist match might predict client's compliance better than therapeutic alliance. However, this is a *post hoc* interpretation and should be tested in the future to evaluate its plausibility.

Limitations and Recommendations

Moderate levels of agreement as indicated by Cohen's Kappa presented a limitation on this study, particularly at the level of data collection. This study performed Yule's Q as a supplementary reliability analysis to evaluate internal consistency (Bakeman et al., 1997), finding a large internal consistency on the CRB1-TCRB1 and CRB2-TCRB2 dyads in most intervention sessions across participants. Differences between Cohen's Kappa and Yule's Q can be related to the small number of outside

codes and variability of simple probabilities observed in this study, particularly in Sansa' and Catelyn's sequences.

Reliability limitations were evident in some aspects of the coding system. In particular, the noise created by codes that provide no or poor information on the therapeutic relationship may have been problematic. Between-participants analysis showed that codes related to participants behaviors out of session (O1, RO1, O2, and RO2) seldom occurred (Appendix F), which likely affected coders' discrimination of clients' improvements within and outside session. However, this might be related to the short length of intervention that was not enough to create opportunities for out of session behaviors.

Another factor that may hinder reliability was coders had little or no clinical experience with FAP. Instead, other FAP studies that obtained better interrater reliability (Busch et al. 2009; Esparza et al., 2015; Oshiro, Kanter, & Meyer, 2012; Villas-Boas et al., 2016) employed advanced doctoral students and licensed psychologists as coders. This lack of experience may have minimized any allegiance effects or observer bias, but for future studies, inclusion of coders who have practiced FAP for at least two years is suggested. For novice FAP coders, it is recommended to follow structured protocols as Ray and Ray (2008) that includes multiple examples of FAP interactions. For this purpose, it is recommended to create a training tool kit comprised of several videotapes including typical positive and ineffective FAP interactions.

Methodological constraints associated with the non-concurrent multiple baseline designs (NCMBL) might conceal history threats that affected participants individually.

However, participants did not report unanticipated events that influence their lives while they were part of this study. Otherwise, it is reasonable to think NCMBL was useful to test FAP effects. Unless unlikely coincidences have happened, phase change analyses demonstrated that clinical outcomes were the result of contingent reinforcement across participants.

Conclusion

The empirical examination of the mechanism of change of FAP found that higher levels of contingent reinforcement were responsible for meaningful changes in psychological distress and interpersonal functioning. This study offers a process-to-outcome model of FAP (Figure 14) that can be used to explain other behaviorally-based interventions. Though this is exploratory research, it does provide novel venues to study mechanisms of change in therapy beyond correlational analyses. A door for investigating the clinical validity of behavioral process-based interventions has been opened, and a call for replications in other contexts and populations has been made.

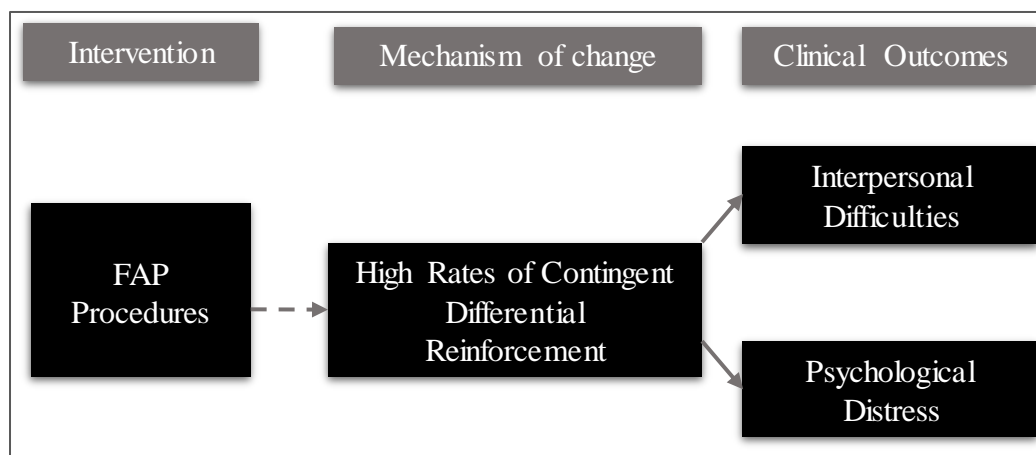


Figure 14. FAP causal path.

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Appendix A

Eligibility Clinical Interview

Reasons for seeking help

Psychological/Psychiatric History

a. Has the participant ever been hospitalized or in therapy?

b. Has the participant been diagnosed previously? Y N

If yes, please indicate what was the diagnosis

c. Is the participant taking medication³? Y N

If yes, please indicate the type/name of medication and how long he/she has been taking it.

d. Has the participant ever taken medication? Y N

If yes, please indicate the type/name of medication.

Does the participant meet exclusion criteria listed below?

- Suicidal attempts Y N
- Current Suicidal plan Y N

³ A list of common medication for psychotic and bipolar disorders is listed below. If participant's medication is not listed below. Please go to <https://www.nimh.nih.gov/health/topics/mental-health-medications/index.shtml>

- Current Alcohol or Substance use⁴ Y N
- History of psychotic or bipolar disorders Y N
- Participant has not stability in his/her medication (less than 6-weeks) Y N

Guide questions Interpersonal Functioning (FIAT Classes)

Assertion needs (Class A)

1. Think about a recent time when you needed something from someone else. What did you do?
 - a. How did you decide to make this request?
 - b. Whom did you ask?
 - c. How did you ask for what you wanted?
2. Briefly describe a time when you asked for something from someone and it went well?
 - a. Is this consistent with how things usually go for you when making requests?
 - b. Why do you think that it went well?
3. Now tell me a time when you asked for something, but it didn't go very well.
 - a. Is this consistent with how things usually go?
 - b. Why do you think that it didn't go well?
4. Are you having any challenges or problems right now with getting your needs met with others?
5. Do you think this issue could come up in therapy between you and me?

Bidirectional communication (Class B)

1. Think about a recent time when you interacted with someone and you received some type of feedback from the person about how the interaction went (or was going). What did you do?
 - a. How did you know you were being given feedback?

⁴ See list for substance use Diagnostic criteria

- b. How did you decide whether this feedback was accurate?
2. Tell me a time when you received feedback from others and the things with that person or others were better because you changed your behavior as a result of the feedback.
3. Now tell me a time when you received feedback from others and the things with that person or others did not improve (either then or in another situation).
 - a. Is this consistent with how things usually go?
 - b. Why do you think that it didn't go well?
4. Are you having any challenges or problems right now with getting feedback from others or noticing your impact on others?
5. Do you think this issue could come up in therapy between you and me?
 - a. What would that look like if it did?
 - b. What would you do if you got feedback from me about something that mattered to you?

Conflicts (Class C)

1. What do you do if you are upset with someone else that you have a relationship with?
 2. How do you try to resolve conflict with others?
 3. Think about a recent time when had a conflict with another person. What did you do?
 - a. How did you know that a conflict was occurring?
 - b. What did you do in this situation?
 - c. Did you attempt to resolve the conflict?
 - d. Do you think that your opinion was heard?
 - e. Did you try to understand what the other person was trying to say?
 4. Tell me a time when you had some type of conflict with someone else and the interaction went well for you.
-
-

5. Now tell me a time when you had some type of conflict with someone else, and the interaction didn't go very well.

6. Do you think this issue could come up in therapy between you and me?

Disclosure/Closeness (Class D)

1. How do you know someone cares about you or is close to you?
 2. How do you think someone knows you care about them or that you feel close to them?
 3. Are there times when you talk with others about how you are feeling or your experiences?
 4. Think about a recent time when you felt like talking with someone about how you were feeling. What did you do?
 - a. Did you decide to talk with another person about how you were feeling?
 - b. How did you decide to talk (or not talk) about how you were feeling?
 - c. How did you make your experience understood by the other person?
 5. Tell me a time when you talked to someone about your experiences and the discussion went well for you.
-
-

6. Now tell me a time when you talked to someone about your experiences, but the experience wasn't very good.

7. Do you think this issue could come up in therapy between you and me?

Emotional experience (Class E)

1. Are there feelings that are easier for you to experience compared to others?

2. Are there feelings that are easier for you to express to other people relative to other feelings you have?

3. Think about a recent time when you felt something (strongly). What did you do?

Describe behavior and effects of these responses

4. Tell me a time when you felt something strongly when the experience went well for you.

5. Now tell me a time when you had a feeling, but the experience wasn't very good.

Case formulation & therapeutic goals

List of Medication

Antipsychotic

- Chlorpromazine
- Haloperidol
- Perphenazine
- Fluphenazine
- Risperidone
- Olanzapine
- Quetiapine
- Ziprasidone
- Aripiprazole
- Paliperidone
- Lurasidone

Mood Stabilizers

- Carbamazepine
- Lamotrigine
- Oxcarbazepine
- Valproic acid (i.e., divalproex sodium)
- Lithium

Other medication

Antidepressants

- Fluoxetine
- Citalopram
- Sertraline
- Paroxetine
- Escitalopram
-

Anti-Anxiety medication

- Clonazepam
- Alprazolam
- Lorazepam

List Alcohol and Cannabis Use Disorder Diagnostic Criteria (American Psychiatric Association, 2013, p. 490-491)

A. A problematic pattern of alcohol use leading to clinically significant impairment or distress, as manifested by at least two of the following, occurring within a 12-month period:

1. Alcohol/Cannabis is often taken in larger amounts or over a longer period than was intended.
2. There is a persistent desire or unsuccessful efforts to cut down or control Alcohol/Cannabis use.
3. A great deal of time is spent in activities necessary to obtain Alcohol/Cannabis, use Alcohol/Cannabis, or recover from its effects.
4. Craving, or a strong desire or urge to use Alcohol/Cannabis.
5. Recurrent alcohol use resulting in a failure to fulfill major role obligations at work, school, or home.
6. Continued Alcohol/Cannabis use despite having persistent or recurrent social or interpersonal problems caused or exacerbated by the effects of Alcohol/Cannabis.
7. Important social, occupational, or recreational activities are given up or reduced because of Alcohol/Cannabis use.
8. Recurrent Alcohol/Cannabis use in situations in which it is physically hazardous.
9. Alcohol/Cannabis use is continued despite knowledge of having a persistent or recurrent physical or psychological problem that is likely to have been caused or exacerbated by Alcohol/Cannabis.
10. Tolerance, as defined by either of the following:
 - a. A need for markedly increased amounts of Alcohol/Cannabis to achieve intoxication or desired effect.
 - b. A markedly diminished effect with continued use of the same amount of Alcohol/Cannabis.
11. Withdrawal, as manifested by either of the following:
 - a. The characteristic withdrawal syndrome for Alcohol/Cannabis
 - b. Alcohol/Cannabis (or a closely related substance, such as a benzodiazepine) is taken to relieve or avoid withdrawal symptoms.

Appendix B

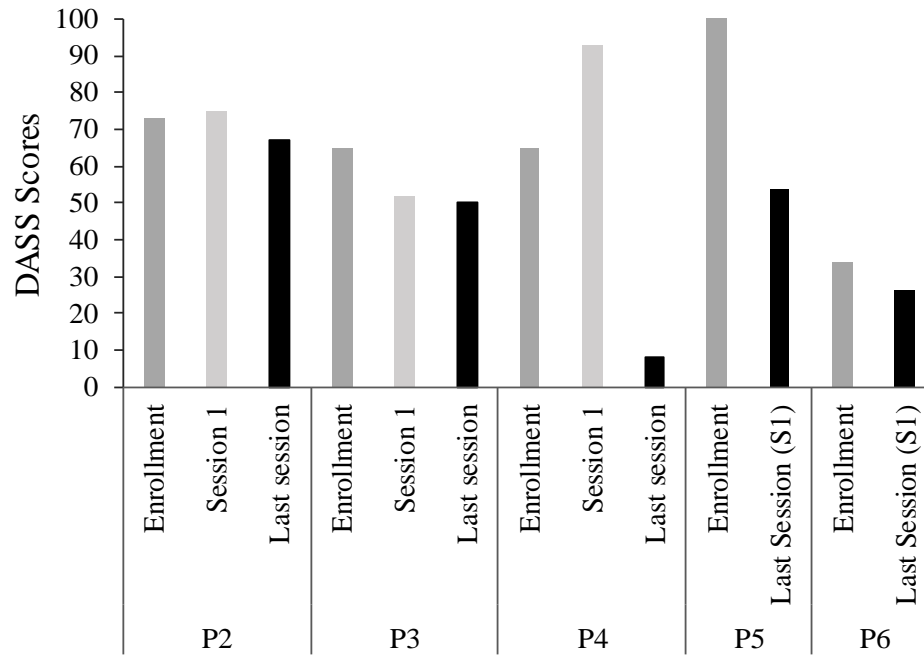
Participants Initial Randomization to Baseline and Therapists

Participant Code	Baseline Length (Randomization)	Therapist Assigned (Randomization)
Arya**	3 sessions	T2
P2	5 sessions	T2
P3	6 sessions	T1
P4	7 sessions	T1
P5	7 sessions	T1
P6	3 sessions	T2

****Fictional name**

Appendix C

Psychological distress scores across participants who dropped out



Appendix D

Consent Forms (Provided by University of Nevada-Reno IRB)

University of Nevada, Reno Social Behavioral Research Consent Form

Title of Study:	Assessing the Mechanism of Change of the Functional Analytic Psychotherapy
Principle Investigator:	William Follette
Co-Investigators / Study Contact:	Amanda M. Muñoz-Martinez
Study ID Number:	
Sponsor:	

Introduction

You are being invited to participate in a research study. Before you agree to be in the study, read this form carefully. It explains why we are doing the study; and the procedures, risks, discomforts, benefits and precautions involved.

At any time, you may ask one of the researchers to explain anything about the study that you do not understand.

It's important you are completely truthful about your eligibility to be in this study. If you are not truthful, you may be harmed by being in the study.

You do not have to be in this study. Your participation is voluntary. If you do not agree to participate, you will receive the care you would have received if the study was not taking place.

Take as much time as you need to decide. If you agree now but change your mind, you may quit the study at any time. Just let one of the researchers know you do not want to continue.

Why are we doing this study?

We are doing this study to find out the variables that explain how the Functional Analytic Psychotherapy (FAP) works. FAP is a therapeutic procedure focused in the therapeutic relationship that seeks providing services to participants presenting difficulties in their social interactions and relationships. FAP research is the earlier stage though it has demonstrated positive effects enhancing interpersonal relationships, further research in this area is need to have conclusive results. We are asking people like you who have reported interpersonal relating difficulties and psychological distress to help us to achieve three main aims

- To establish the explanatory factors of FAP
- To determine the effectiveness of FAP on reducing interpersonal difficulties, and

- To establish whether therapists' responses to your interpersonal difficulties in-session change the way in which you interact with others outside session.

Benefits of research cannot be guaranteed but we hope to learn why Functional Analytic Psychotherapy function and its relation with interpersonal behaviors.

Why are we asking you to be in this study?

We are asking you to be in this study because you reported difficulties in establishing and/or maintaining relationships, psychological distress, and interest in receiving psychological services.

What are the circumstances that could prevent my participation on this study?

There are four reasons that could prevent your participation in this study:

- Current substance abuse.
- Current suicidal plan.
- Past suicidal attempts.
- History of psychotic or bipolar disorders

How we will determine that you are eligible for participating in this study?

You must meet two criteria for be eligible to participate in this study. One, you have to report interpersonal difficulties and psychological distress. To determine that you present those difficulties, two self-reports will be administered and a clinical interview will be conducted in the eligibility assessment session. Two, you have to consent to allow researchers to video-record all your therapeutic sessions. This study seeks to identify the factors that explain therapeutic changes within the clinical setting, therefore, the primary data to assess this will come from the video-records of the interaction you have with your therapist in-session.

How many people will be in this study?

We expect to enroll up to 10 participants that will receive therapeutic services at the Psychological Services Center (PSC) in the University of Nevada-Reno [REDACTED]

What will you be asked to do if you agree to be in the study?

If you agree to be in this study, you will be asked to attend to a 1-hour therapeutic session weekly. Each session will be video-recorded so that we can study the behavior of the therapist in response to clinical issues that come up during the session. For this aim, we will ask your consent for video-recording all therapeutic interaction (45 minutes of each session). We also will ask you to participate in three phases on this study. In the first phase, we will assess your interpersonal functioning and psychological distress while receiving emotional support. Functional Analytic Psychotherapy will be implemented during the second phase. Finally, we will conduct a 15-

minutes follow-up session one month after ending therapy to fill out psychological measurements in person. Before and after each session, you will be asked to fill out self-report measurements to assess your interpersonal functioning and psychological distress.

How long will you be in the study?

The study will take about 17 weeks of your time; you will participate for about 17 weeks.

What are your choices if you do not volunteer to be in this research study?

If you decide not to be in the study, your other choices may include:

Getting no treatment.

Being referred for psychological services from another therapist in the PSC not involved in the research. This site offers a sliding scale fee for people outside of the UNR community and it is free for UNR students.

Being referred for psychological services to an outside center in the community.

What if you agree to be in the study now, but change your mind later?

You do not have to stay in the study. You may withdraw from the study at any time by contacting the co-investigator Amanda M. Munoz-Martinez to the e-mail: [REDACTED]

, or phone number: [REDACTED] You also can contact the principal investigator William Follette to the e-mail: [REDACTED] or phone number: [REDACTED]

What if the study changes while you are in it?

If anything about the study changes or if we want to use your information in a different way, we will tell you and ask if you if you want to stay in the study. We will also tell you about any important new information that may affect your willingness to stay in the study.

Is there any way being in this study could be bad for you?

If you participate in this study, you may experience emotional distress associated with the disclosure of your interpersonal difficulties.

What happens if you become injured because of your participation in the study?

It is not expected that you result injured by participating in this study. In the event that this research activity results in an injury, treatment will be available. This includes first aid, emergency treatment, and follow-up care as needed. Care for such injuries will be charged to your insurance.

Will being in this study help you in any way?

We cannot promise you will benefit from being in this study but you may improve your interpersonal functioning and reduce your psychological distress.

Who will pay for the costs of your participation in this research study?

No costs are associated with participation in this study.

Will you be paid for being in this study?

You will not receive any payment for being in this study.

Who will know that you are in in this study and who will have access to the information we collect about you?

The researchers, the University of Nevada, Reno Institutional Review Board, and US Department of Health and Human Services (DHHS) will have access to your study records.

A description of this clinical trial will be available on <http://www.ClinicalTrials.gov> as required by U.S. Law. This website will not include information that can identify you. At most, the website will include a summary of the results. You can search this website at any time.

By law, we must notify the authorities if we find or suspect [child abuse, elder abuse, an intent to harm yourself or others; or determine you have an infectious disease and have not reported it yourself].

How will we protect your private information and the information we collect about you?

We will treat your identity with professional standards of confidentiality and protect your private information to the extent allowed by law. We will do this by assigning you a code list, filing your personal information in a locked file cabinet in the Psychological Services Center, storing your self-reports in a locked file cabinet in the principal investigator (PI) laboratory, and saving your video-records in a password protected computer in the PI laboratory.

We will not use your name or other information that could identify you in any reports or publications that result from this study.

Do the researchers have monetary interests tied to this study?

The researchers and/or their families have no monetary interests tied to this study.

Who can you contact if you have questions about the study or want to report an injury?

At any time, if you have questions about this study or wish to report an injury that may be related to your participation in this study, contact Dr. William Follette, phone number: [REDACTED] or Amanda M. Muñoz-Martinez, phone number: [REDACTED]

Who can you contact if you want to discuss a problem or complaint about the research or ask about your rights as a research participant?

You may discuss a problem or complaint or ask about your rights as a research participant by calling the University of Nevada, Reno Research Integrity Office at (775) 327-2368. You may also use the online *Contact the Research Integrity Office* form available from the [Contact Us](#) page of the University's Research Integrity Office website.

Agreement to be in study

If you agree to participate in this study, you must sign this consent form. We will give you a copy of the form to keep.

Participant's Name Printed

Signature of Participant

Date

Signature of Person Obtaining Consent

Date

University of Nevada, Reno
Photo/Video Release Form for Research

Title of Study: **Assessing the Mechanism of Change of the Functional Analytic Psychotherapy**
Principle Investigator: **William C. Follette**
Co-Investigators: **Amanda M. Muñoz-Martinez**
IRB Number:

Video-recordings will be made of you during your participation in this research project. Researchers will record all therapeutic session, 45-min of the therapeutic interaction. Please indicate below how we may use your images. Agreeing to allow your images to be used for research is completely voluntary and up to you. In any use of your images, your name will not be disclosed.

For all uses to which you agree, please initial in the spaces provided in the following table:

Initials	Uses
	The images will be studied by the research team for this research project.
	The images may be used at meetings of scientists interested in the study of the mechanism of change and therapeutic interactions in behavioral interventions (Optional) .
	The images may be used in classrooms to teach students about mechanism of the mechanism of change and therapeutic interactions in behavioral interventions (Optional) .

You have the right to request that the recording be stopped or erased at any time.

By signing below, you are agreeing that you have read the above description and give your consent for the uses of your images as indicated by your initials.

Participant's Name Printed

Signature of Participant

Date

Signature of Person Obtaining Consent

Date

Video Release Form of Optional Choices You Agreed Above**For all uses to which you agree, please initial in the spaces provided in the following table:**

Initials	Uses
	The images may be used at meetings of scientists interested in the study of the mechanism of change and therapeutic interactions in behavioral interventions
	The images may be used in classrooms to teach students about mechanism of the mechanism of change and therapeutic interactions in behavioral interventions

By signing below, you are agreeing that you have read the above description and give your consent for the uses of your images as indicated by your initials.

 Participant's Name Printed

 Signature of Participant

 Date

 Signature of Person Obtaining Consent

 Date

University of Nevada, Reno
Permission to Use, Create and Share Your Protected Health Information

Title of Study: Assessing the Mechanism of Change of the Functional Analytic Psychotherapy
Principle Investigator: William C. Follette
Study ID Number:

This form describes what researchers will do with information about you. We are asking you to allow your health care providers to share your health information for a research study.

Your medical care will not change in any way if you say no.

Why sign this document?

To let the researchers from the University of Nevada, Reno use and share your health information for this study, sign this document. We will give you a copy.

Why are you asking for my information?

We want to learn more about how to help people who experience interpersonal difficulties and psychological distress. This study will help us to learn more about the mechanisms of change of Functional Analytic Psychotherapy (FAP) by providing psychological services to participants who present interpersonal difficulties. We are asking people like you who have reported interpersonal relating difficulties and psychological distress to help us.

What information will you use and share for the study?

*If you say **YES**, we will access and use the information is marked with an "X":*

Information from your record (past, present and new information), such as how often you visited the doctor and the reason for your visits, what medicines you take, the results of lab tests, and your medical record number, sex, and date of birth.

Specific information concerning:

alcohol abuse drug abuse sickle cell anemia HIV

Demographic information such as name, age, race, etc.

Billing or financial records

Photographs, videotapes, and/or audiotapes of you

Questionnaire, survey, and/or subject diary

HIPAA PHI identifiers (select all HIPAA PHI or those that apply):

- | | | |
|---|--|---|
| <input type="checkbox"/> All HIPAA PHI | <input type="checkbox"/> Certificate/license numbers | <input type="checkbox"/> Internet URLs |
| <input checked="" type="checkbox"/> Names | <input type="checkbox"/> Device identifiers/serial numbers | <input type="checkbox"/> Vehicle ID, serial, and license plate numbers |
| <input type="checkbox"/> Biometric identifiers including finger/voice print | <input checked="" type="checkbox"/> Telephone numbers | <input type="checkbox"/> Dates relevant to an individual or any age over 89, specify: |
| <input checked="" type="checkbox"/> Full face photographic or comparable images | <input type="checkbox"/> Fax numbers | <input type="checkbox"/> Geographic subdivision smaller than a state, specify: |
| <input type="checkbox"/> Social security numbers | <input type="checkbox"/> Account numbers | <input checked="" type="checkbox"/> Other unique identifying number, characteristic, or code, specify: Home address |
| <input type="checkbox"/> Medical record numbers | <input checked="" type="checkbox"/> Email addresses | |
| <input type="checkbox"/> Health plan beneficiary numbers | <input type="checkbox"/> IP addresses | |

The information we are asking to use, and share is called "Protected Health Information." It is protected by a federal law called the **Privacy Rule** of the Health Insurance Portability and Accountability Act (HIPAA). In general, we cannot use or share your health information for research without your permission.

If you want, we can give you more information about the **Privacy Rule**.

How will you use and share this information?

- We will use your information only for the study described in this document.

We will do our best to make sure your information stays private. But, if we share information with people who do not have to follow the Privacy Rule, your information will no longer be protected by the Privacy Rule. Let us know if you have questions about this.

What happens if I say no?

This means you can tell us to stop using and sharing your information. We will not get your information. The care you get from your doctor will not change.

What happens if I say yes, but change my mind later?

At any time, you can tell us to stop using and sharing health information that can be traced to you. We will stop, except in very limited cases if needed to comply with law, protect your safety, or make sure the research was done properly. If you have any questions about this, please ask.

If you want us to stop collecting and using your information, please tell us in writing. Write or e-mail to Dr. William Follette [REDACTED]

██████████ If you have questions, call the study contact Amanda M. Munoz-Martinez, phone number: ██████████ or Dr. William Follette, phone number ██████████

If you stop, the care you get from your doctor will not change.

How long will my health information be used?

We expect our study to take at least one year. After the study is done, your health care provider at University of Nevada-Reno will no longer share your information with us and we will no longer use or share your information. We will retain the research records for up to five years after completion of the research. After that time frame, all identifiers in the records will be redacted. Digital video records will be retained only for the purposes to which you agreed in the video consent.

What if I have questions?

If you have any questions about the study, call the study contact, Amanda M. Munoz-Martinez, phone number: ██████████ or Dr. William Follette, phone number: ██████████. Please call if you have:

- Questions about your rights.
- Questions about how we will use and share your information.

By signing the document:

- You are letting us use and share your health information for this study.

Your name (please print)

Your signature

Date

Name of person conducting the consent discussion (please print)

Signature of person conducting the consent discussion

Date

Appendix E

History Assessment

The objective of recovering clients' historical information is to complement clinical case formulation by expanding the understanding of events associated with clients' clinical presentation. Research in case formulation has shown that information on predisposing factors (historical events) that "are assumed to have produced an increased vulnerability to developing symptoms" (Eells, Kedjelic, & Lucas, 1998, p.147) is crucial to conceptualize clinical cases (Eells, 2011). In this study, we will recover information on social, family, and cultural factors that might be associated with the development of participants interpersonal difficulties. To **AVOID** leading client to generate "insights" when describing historical factors, it is recommended to formulate open-ended questions. Questions **MUST NOT** contain statements that lead participants to establish relations of causality between events. Some examples of forbidden questions are next:

- Do you think that X event lead to Y outcome?
- Why X affected in Y way?
- Do you think that event X affected the way you currently behave?
- What do you think about the way in which event X lead to event Y?

During baseline, guidelines for evaluating *developmental, psychosocial, and sociocultural history* American Psychiatric Association (APA; 2002) will be utilized as a complementary tool to recover participants' history information. Questions formulated on these guidelines include (p.16):

- What have been the most important events in the patient's life, and what were the patient's responses to them?
- What is the patient's history of formal education?
- What is the patient's cultural, religious, and spiritual beliefs, and how have these developed or changed over time?
- Is there a history of parental loss or divorce; physical, emotional, or sexual abuse; or exposure to other traumatic experiences?
- What strategies for coping has the patient used successfully during times of stress or adversity?
- During childhood or adolescence, did the patient have risk factors for any mental disorders?
- What has been the patient's capacity to maintain interpersonal relationships, and what is the patient's history of marital and other significant relationships?
- What is the patient's sexual history, including sexual orientation, beliefs, and practices?
- Does the patient have children?
- What past or current psychosocial stressors have affected the patient (including primary support group, social environment, education, occupation, housing, economic status, and access to health care)?
- What is the patient's capacity for self-care?
- What is the patient's sociocultural supports (e.g., family, friends, work, and religious and other community groups)?
- What is the patient's own interests, preferences, and values with respect to health care?

Other questions and description of developmental, psychosocial, and sociocultural history, which are recommended to utilize for recovering participants' historical information, would be found in pag. 21 and 22 of the *Practice guidelines for the psychiatric evaluation of adults* (APA, 2002).

Appendix F

FAPRS codes between participants and across sessions

Ss	FAPRS Codes											
	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	IN
Arya												
S1	12	2	26	8	17	11	6	0	0	14	31	0
S2	3	0	2	1	2	1	0	1	0	36	41	0
S3	7	2	13	3	5	0	0	2	2	22	33	0
S4	9	7	9	7	7	0	0	0	0	28	26	0
S5	8	6	16	6	16	1	1	4	3	28	26	0
S6	12	12	20	10	12	3	2	5	1	20	25	0
S7	10	7	16	9	5	0	0	0	0	23	22	0
S8	2	1	23	13	11	0	0	4	3	11	13	0
S9	3	3	15	6	8	2	2	3	2	18	21	0
S10	25	22	34	17	14	0	0	3	2	25	30	0
S11	1	1	22	7	11	0	0	7	5	15	22	0
S12	2	2	17	10	10	0	0	0	0	18	16	0
Sansa												
S1	0	0	30	2	12	0	0	0	0	18	32	2
S2	3	0	11	1	5	0	0	0	0	24	32	0
S3	6	0	25	1	24	6	0	0	0	29	30	9
S4	4	0	28	0	15	0	0	0	0	18	27	9
S5	3	0	21	3	11	0	0	0	0	27	32	5
S6	2	0	23	7	16	0	0	0	0	11	14	0
S7	1	0	47	10	18	0	0	0	0	19	40	0
S8	14	2	23	11	18	0	0	0	0	18	21	4
S9	15	1	38	10	25	0	0	0	0	16	31	3
S10	8	3	27	11	22	0	0	0	0	21	19	2
S11	5	3	41	10	24	0	0	1	0	13	24	0
S12	2	2	22	13	10	0	0	1	1	26	26	0
S13	0	0	24	10	15	0	0	4	1	16	19	0
S14	0	0	32	16	14	0	0	1	0	10	13	1
Catelyn												
S2	11	0	8	0	2	0	0	0	0	8	17	8
S3	25	0	1	0	1	0	0	0	0	5	5	25
S4	17	0	2	0	3	0	0	0	0	11	18	9
S5	31	0	2	0	2	0	0	0	0	5	11	26
S6	26	0	3	0	1	0	0	0	0	7	8	26
S7	18	4	16	8	10	0	0	0	0	22	29	4
S8	15	4	17	6	11	1	0	0	0	20	27	4
S9	12	1	21	2	13	0	0	0	0	20	33	5
S10	22	3	19	8	11	0	0	0	0	34	37	12
S11	24	5	30	9	13	0	0	0	0	16	32	13
S12	11	5	14	5	7	0	0	0	0	18	25	2
S13	6	1	26	13	10	0	0	0	0	7	12	3
S14	14	4	17	6	12	0	0	0	0	11	18	3
S15	9	4	27	9	7	0	0	0	0	32	44	4

Sansa-Baseline Individual Lag Seq Analyses

S1**Transitional Probabilities**

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
TCRB1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CRB2	.0000	.0000	.0000	.0667	.3333	.0000	.0000	.0000	.0000	.0000	.5333	.0667
TCRB2	.0000	.0000	1.000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
ERB	.0000	.0000	1.000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.1176	.0000	.0000	.0000	.0000	.0000	.8824	.0000
TPR	.0000	.0000	.4688	.0000	.0000	.0000	.0000	.0000	.0000	.5313	.0000	.0000
INF	.0000	.0000	.5000	.0000	.0000	.0000	.0000	.0000	.0000	.5000	.0000	.0000

S2**Transitional Probabilities**

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	.0000	.0000	.0000	.0000	.5000	.0000	.0000	.0000	.0000	.0000	.0000	.5000
TCRB1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CRB2	.0000	.0000	.0000	.0909	.0000	.0000	.0000	.0000	.0000	.0000	.6364	.2727
TCRB2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
ERB	.2000	.0000	.8000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.1250	.0000	.0000	.0000	.0000	.0417	.8333	.0000
TPR	.0357	.0000	.2143	.0000	.0357	.0000	.0000	.0000	.0000	.7143	.0000	.0000
INF	.0000	.0000	.2500	.0000	.0000	.0000	.0000	.0000	.0000	.7500	.0000	.0000

S3**Transitional Probabilities**

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	.0000	.0000	.0000	.0000	.5000	.0000	.0000	.0000	.0000	.0000	.0000	.5000
TCRB1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CRB2	.0000	.0000	.0000	.0400	.4000	.0000	.0000	.0000	.0000	.0000	.3200	.2400
TCRB2	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.000	.0000	.0000
ERB	.1250	.0000	.7917	.0000	.0000	.0833	.0000	.0000	.0000	.0000	.0000	.0000
O1	.0000	.0000	.0000	.0000	.5000	.0000	.0000	.0000	.0000	.0000	.5000	.0000
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.3103	.0000	.0000	.0000	.0000	.0000	.6897	.0000
TPR	.0345	.0000	.1724	.0000	.0000	.0690	.0000	.0000	.0000	.7241	.0000	.0000
INF	.2222	.0000	.1111	.0000	.0000	.0000	.0000	.0000	.0000	.6667	.0000	.0000

S7**Transitional Probabilities**

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2			
CPR	TPR	INF										
CRB1	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.000	.0000
TCRB1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CRB2	.0000	.0000	.0000	.2128	.3404	.0000	.0000	.0000	.0000	.0000	.4468	.0000
TCRB2	.0000	.0000	.8000	.0000	.0000	.0000	.0000	.0000	.0000	.2000	.0000	.0000
ERB	.0556	.0000	.9444	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.1053	.0000	.0000	.0000	.0000	.0000	.8947	.0000
TPR	.0000	.0000	.5641	.0000	.0000	.0000	.0000	.0000	.0000	.4359	.0000	.0000
INF	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999

S8**Transitional Probabilities**

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2			
CPR	TPR	INF										
CRB1	.0000	.1429	.0000	.0000	.3571	.0000	.0000	.0000	.0000	.0000	.2143	.2857
TCRB1	.5000	.0000	.5000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
CRB2	.0000	.0000	.0000	.4348	.3043	.0000	.0000	.0000	.0000	.0000	.2609	.0000
TCRB2	.4000	.0000	.5000	.0000	.0000	.0000	.0000	.0000	.0000	.1000	.0000	.0000
ERB	.3333	.0000	.6667	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0556	.3333	.0000	.0000	.0000	.0000	.0000	.6111	.0000
TPR	.0952	.0000	.1905	.0000	.0000	.0000	.0000	.0000	.0000	.7143	.0000	.0000
INF	.2500	.0000	.2500	.0000	.0000	.0000	.0000	.0000	.0000	.5000	.0000	.0000

Catelyn-Baseline Individual Lag Seq Analyses

S1

Transitional Probabilities

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	.0000	.0000	.0000	.0000	.0323	.0000	.0000	.0000	.0000	.0000	.1613	.8065
TCRB1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CRB2	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.000	.0000
TCRB2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
ERB	.0000	.0000	1.000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.000	.0000
TPR	.4211	.0000	.1579	.0000	.0000	.0000	.0000	.0000	.0000	.4211	.0000	.0000
INF	.9600	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0400	.0000	.0000

S2

Transitional Probabilities

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	.0000	.0000	.0000	.0000	.1818	.0000	.0000	.0000	.0000	.0000	.2727	.5455
TCRB1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CRB2	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.8750	.1250
TCRB2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
ERB	.0000	.0000	1.000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.000	.0000
TPR	.2941	.0000	.3529	.0000	.0000	.0000	.0000	.0000	.0000	.3529	.0000	.0000
INF	.8571	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.1429	.0000	.0000

S3

Transitional Probabilities

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	.0000	.0000	.0000	.0000	.0400	.0000	.0000	.0000	.0000	.0000	.0000	.9600
TCRB1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CRB2	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.000
TCRB2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
ERB	1.000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.000	.0000
TPR	.0000	.0000	.2500	.0000	.0000	.0000	.0000	.0000	.0000	.7500	.0000	.0000
INF	.9200	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0800	.0000	.0000

S4**Transitional Probabilities**

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	.0000	.0000	.0000	.0000	.1176	.0000	.0000	.0000	.0000	.0000	.4118	.4706
TCRB1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CRB2	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.5000	.5000
TCRB2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
ERB	.6667	.0000	.3333	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.0909	.0000	.0000	.0000	.0000	.0000	.9091	.0000
TPR	.3529	.0000	.0588	.0000	.0000	.0000	.0000	.0000	.0000	.5882	.0000	.0000
INF	1.000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

S5**Transitional Probabilities**

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	.0000	.0000	.0000	.0000	.0645	.0000	.0000	.0000	.0000	.0000	.1290	.8065
TCRB1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CRB2	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.5000	.5000
TCRB2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
ERB	.5000	.0000	.5000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.000	.0000
TPR	.5000	.0000	.1000	.0000	.0000	.0000	.0000	.0000	.0000	.4000	.0000	.0000
INF	.9615	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0385	.0000	.0000

S6**Transitional Probabilities**

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	.0000	.0000	.0000	.0000	.0385	.0000	.0000	.0000	.0000	.0000	.0385	.9231
TCRB1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CRB2	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.3333	.6667
TCRB2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
ERB	1.000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.000	.0000
TPR	.2500	.0000	.1250	.0000	.0000	.0000	.0000	.0000	.0000	.6250	.0000	.0000
INF	.8846	.0000	.0769	.0000	.0000	.0000	.0000	.0000	.0000	.0385	.0000	.0000

Catelyn-FAP Individual Lag Seq Analyses

S7

Transitional Probabilities

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2			
CPR	TPR	INF										
CRB1	.0556	.2222	.0556	.0000	.2778	.0000	.0000	.0000	.0000	.0000	.1667	.2222
TCRB1	.2500	.0000	.7500	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
CRB2	.0000	.0000	.0000	.5000	.1875	.0000	.0000	.0000	.0000	.0000	.3125	.0000
TCRB2	.0000	.0000	.5000	.0000	.0000	.0000	.0000	.0000	.0000	.5000	.0000	.0000
ERB	.7000	.0000	.2000	.0000	.0000	.0000	.0000	.0000	.0000	.1000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0455	.0000	.0000	.0000	.0909	.0000	.0000	.0000	.0000	.0000	.8636	.0000
TPR	.1786	.0000	.2143	.0000	.0000	.0000	.0000	.0000	.0000	.5714	.0357	.0000
INF	.7500	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.2500	.0000	.0000

S8

Transitional Probabilities

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2			
CPR	TPR	INF										
CRB1	.0000	.2667	.0000	.0000	.2667	.0000	.0000	.0000	.0000	.0000	.2667	.2000
TCRB1	.7500	.0000	.2500	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
CRB2	.0000	.0000	.0000	.3529	.1765	.0000	.0000	.0000	.0000	.0000	.4118	.0588
TCRB2	.1667	.0000	.5000	.0000	.0000	.0000	.0000	.0000	.0000	.3333	.0000	.0000
ERB	.3636	.0000	.6364	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.2000	.0500	.0000	.0000	.0000	.0000	.7500	.0000
TPR	.1111	.0000	.2222	.0000	.0000	.0000	.0000	.0000	.0000	.6667	.0000	.0000
INF	1.000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

S9

Transitional Probabilities

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	.0000	.0833	.0000	.0000	.4167	.0000	.0000	.0000	.0000	.0000	.1667	.3333
TCRB1	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	1.000	.0000	.0000
CRB2	.0000	.0000	.0000	.0952	.2857	.0000	.0000	.0000	.0000	.0000	.5714	.0476
TCRB2	.5000	.0000	.5000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
ERB	.3846	.0000	.6154	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0500	.0000	.1000	.0000	.0000	.0000	.0000	.0000	.8500	.0000
TPR	.0938	.0000	.3438	.0000	.0000	.0000	.0000	.0000	.0000	.5313	.0313	.0000
INF	.6000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.4000	.0000	.0000

S10**Transitional Probabilities**

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	.0476	.1429	.0476	.0000	.0476	.0000	.0000	.0000	.0000	.0476	.1905	.4762
TCRB1	.6667	.0000	.3333	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
CRB2	.0000	.0000	.0000	.4211	.1579	.0000	.0000	.0000	.0000	.0000	.3158	.1053
TCRB2	.1250	.0000	.3750	.0000	.0000	.0000	.0000	.0000	.0000	.5000	.0000	.0000
ERB	.3000	.0000	.7000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0333	.0000	.2000	.0000	.0000	.0000	.0000	.0000	.7667	.0000
TPR	.1818	.0000	.1818	.0000	.0000	.0000	.0000	.0000	.0000	.6364	.0000	.0000
INF	.6667	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.3333	.0000	.0000

S11**Transitional Probabilities**

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	.0000	.1667	.0000	.0000	.1667	.0000	.0000	.0000	.0000	.0000	.1250	.5417
TCRB1	.0000	.0000	.7500	.0000	.0000	.0000	.0000	.0000	.0000	.2500	.0000	.0000
CRB2	.0000	.0000	.0000	.3000	.2000	.0000	.0000	.0000	.0000	.0000	.5000	.0000
TCRB2	.1111	.0000	.7778	.0000	.0000	.0000	.0000	.0000	.0000	.1111	.0000	.0000
ERB	.5385	.0000	.4615	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.1875	.0000	.0000	.0000	.0000	.0000	.8125	.0000
TPR	.1935	.0000	.4194	.0000	.0000	.0000	.0000	.0000	.0000	.3871	.0000	.0000
INF	.7692	.0000	.0769	.0000	.0000	.0000	.0000	.0000	.0000	.1538	.0000	.0000

S12**Transitional Probabilities**

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	.0000	.4545	.0000	.0000	.1818	.0000	.0000	.0000	.0000	.0000	.1818	.1818
TCRB1	.8000	.0000	.2000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
CRB2	.0000	.0000	.0000	.3571	.0714	.0000	.0000	.0000	.0000	.0000	.5714	.0000
TCRB2	.2000	.0000	.4000	.0000	.0000	.0000	.0000	.0000	.0000	.4000	.0000	.0000
ERB	.4286	.0000	.5714	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.2222	.0000	.0000	.0000	.0000	.0000	.7778	.0000
TPR	.0833	.0000	.2917	.0000	.0000	.0000	.0000	.0000	.0000	.6250	.0000	.0000
INF	.5000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.5000	.0000	.0000

S13**Transitional Probabilities**

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	.0000	.1667	.0000	.0000	.1667	.0000	.0000	.0000	.0000	.0000	.1667	.5000
TCRB1	.0000	.0000	1.000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
CRB2	.0000	.0000	.0000	.5000	.2308	.0000	.0000	.0000	.0000	.0000	.2692	.0000
TCRB2	.0769	.0000	.6923	.0000	.0000	.0000	.0000	.0000	.0000	.2308	.0000	.0000
ERB	.1000	.0000	.9000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.4286	.0000	.0000	.0000	.0000	.0000	.5714	.0000
TPR	.1818	.0000	.6364	.0000	.0000	.0000	.0000	.0000	.0000	.1818	.0000	.0000
INF	.6667	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.3333	.0000	.0000

S14**Transitional Probabilities**

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	.0000	.2857	.0000	.0000	.2857	.0000	.0000	.0000	.0000	.0000	.2143	.2143
TCRB1	1.000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
CRB2	.0000	.0000	.0000	.3529	.2941	.0000	.0000	.0000	.0000	.0000	.3529	.0000
TCRB2	.3333	.0000	.5000	.0000	.0000	.0000	.0000	.0000	.0000	.1667	.0000	.0000
ERB	.2500	.0000	.7500	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.2727	.0000	.0000	.0000	.0000	.0000	.7273	.0000
TPR	.1176	.0000	.2941	.0000	.0000	.0000	.0000	.0000	.0000	.5882	.0000	.0000
INF	1.000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000

S15**Transitional Probabilities**

	CRB1	TCRB1	CRB2	TCRB2	ERB	O1	RO1	O2	RO2	CPR	TPR	INF
CRB1	.0000	.4444	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.2222	.3333
TCRB1	.2500	.0000	.5000	.0000	.0000	.0000	.0000	.0000	.0000	.2500	.0000	.0000
CRB2	.0000	.0000	.0000	.3333	.1111	.0000	.0000	.0000	.0000	.0000	.5185	.0370
TCRB2	.1111	.0000	.5556	.0000	.0000	.0000	.0000	.0000	.0000	.3333	.0000	.0000
ERB	.0000	.0000	1.000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000
O1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO1	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
O2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
RO2	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999	-9999
CPR	.0000	.0000	.0000	.0000	.1250	.0000	.0000	.0000	.0000	.0000	.8750	.0000
TPR	.0930	.0000	.3023	.0000	.0000	.0000	.0000	.0000	.0000	.6047	.0000	.0000
INF	.7500	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.0000	.2500	.0000	.0000