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Therapeutic Alliance and Treatment Outcomes Among Treatment Seekers with Behavioral Expressions of Addiction

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Abstract: Therapeutic alliance refers to the quality of the working relationship between a therapist and client. Clinicians and researchers have long hypothesized that the therapeutic alliance is an instrumental aspect of psychotherapy (Martin et al., 2000; Del Re et al., 2012). Given the considerable overlap between behavioral and chemical expressions of addiction, and previous therapeutic alliance research with chemical addiction, it is important to consider how therapeutic alliance is associated with those seeking treatment for behavioral expressions of addiction. This study evaluates the impact of stronger therapeutic alliance on addiction treatment outcomes among those seeking care at a treatment center designed to care for a variety of addiction expressions and other mental health disorders. We used data from 97 treatment seekers (i.e., 20.2% of eligible treatment seekers), 91 of whose primary expression of addiction was behavioral, from the pool of treatment seekers at three clinical addiction service locations. This study advances the field and contributes novel findings by including a diverse group of addiction treatment-seekers. The results partially support the hypothesis that a stronger therapeutic alliance from the client's point of view at intake is associated with reductions in the addictive behavior despite negative consequences at termination. Particularly important is a sense of positive collaboration, including a shared understanding of goals, openness, and trust with the therapist. We suggest that clients need to develop, recognize, and maintain a strong therapeutic alliance with their treatment provider early in the treatment process, to maximize the effectiveness of such treatment.

Keywords: Addiction; Hong Kong; Syndrome model; Therapeutic alliance; Treatment seekers

1. Introduction

Therapeutic alliance refers to the quality of the cooperative working relationship between a therapist and client. There are many different overlapping definitions of therapeutic alliance and several related phrases (e.g., working alliance, helping alliance, therapeutic bond; see Martin et al. (2000)). Bordin (1979) proposed three aspects of therapeutic alliance that are applicable to psychotherapy: an agreement between the client and the counselor on goals, an assignment of task(s), and the development of a bond between the client and the counselor. Interested readers can find a discussion about these ideas in the items of McGuire-Snieckus et al.'s Scale to Assess Therapeutic Relationship (STAR) (e.g., "My patient and I share similar expectations regarding his/her progress in treatment."). Clinicians and researchers have long thought that therapeutic alliance is an instrumental aspect of psychotherapy (Martin et al., 2000; Del Re et al., 2012). Previous work has linked a strong therapeutic alliance to enhanced treatment outcomes for a plethora of psychiatric disorders. For example, in a study of 176 clients seeking treatment for various problems (e.g., relational problems, personality disorders, addictive behaviors), Bachelor (2013) observed that components of the client's view of the therapeutic alliance were associated with post-therapy outcomes. A meta-analysis including 190 studies identified a significant relationship between therapeutic alliance and psychotherapy outcome ($r = 0.28$, $p < 0.0001$): Therapeutic alliance accounted for 7.5% of the treatment outcome variance (Horvath et al., 2011). Another literature review argued that “the quality of the client–therapist alliance is a reliable predictor of positive clinical outcome independent of the variety of psychotherapy approaches and outcome measures” (Ardito & Rabellino, 2011, p. 1). Flückiger et al. (2018) performed a more recent meta-analysis and observed similar alliance-outcome correlations ($r = 0.278$ for face-to-face psychotherapy, $r = 0.275$ for Internet-based psychotherapy).

A strong therapeutic alliance likely benefits addiction treatment in general. However, previous work examining this construct has been focused narrowly on treatment within the study of substance use disorders treatment. For example, Glazer et al. (2003) observed a positive association between ratings of therapeutic alliance and cocaine treatment outcomes (i.e., percentage of cocaine-free urine toxicologies and eight consecutive cocaine-free urine screenings). Similarly, Urbanoski et al. (2012) reported that young adults in residential treatment for substance use disorders who reported stronger therapeutic alliance had greater reductions in treatment-related distress. The same is true for adolescents who reported greater reductions in drug use and externalizing symptoms when they had a stronger therapeutic alliance (Hogue et al., 2006). In a study of 1196 clients being treated for alcohol abuse or dependence, Connors et al. (1997) observed associations between both clients' and counselors' assessments of therapeutic alliance and post-treatment drinking behavior. In addition to drug use and associated symptoms, therapeutic alliance also can impact treatment duration. Higher therapeutic alliance ratings from the counselor side are associated with length of retention (i.e., how long a client stayed in treatment) (Meier et al., 2006).

In addition to how therapeutic alliance affects treatment outcomes related to the primary expression of addiction, it is important to consider how the therapeutic alliance might mitigate other co-occurring expressions of addiction and mental health disorders. The comorbidity of addiction and mental health disorders is highly prevalent and often takes the form of a primary mental health issue with addiction as a secondary or associated problem (e.g., Kessler et al., 1996). Despite this body of evidence, clinicians often refer patients to specialized treatment centers specific to whichever disorder is at the forefront of the clinician’s or patient’s mind at the time of consultation. As Shaffer et al. (2018, p. 1373) notes, “…the clinical experience of treatment seekers can be confusing and fragmented.” If a treatment seeker's recovery program is disjointed, especially across multiple counselors, then it might be difficult to settle a single set of treatment goals. This could compromise setting treatment goals, one of Bordin's aspects of therapeutic alliance.

Finally, most of the literature about the impact of therapeutic alliance on addiction treatment has focused on chemical expressions of addiction – expressions involving nicotine, alcohol, or other psychoactive substances. In contrast, few researchers have investigated the impact of therapeutic alliance on the treatment of behavioral expressions of addiction

– expressions involving activities such as gambling, sexual behavior, Internet use, overspending, and eating. At the time of this writing, we have been unable to find research focused on the effects of therapeutic alliance during the study of behavioral addiction, with gambling as the only exception. In a study of 475 treatment seeking problem gambling clients, for example, Dowling and Ćosić (2011) observed significant correlations between therapeutic alliance as observed by both the counselor and the client and gambling treatment outcomes. The syndrome model (Shaffer et al., 2004) posits that addiction can take multiple and various opportunistic forms (e.g., alcohol use disorder, opioid abuse, pathological gambling, excessive shopping). This suggestion rests on evidence showing that there are many similarities among the different expressions of addiction, such as common neurological antecedents, shared social risk factors and shared psychological risk factors (Shaffer et al., 2018).

Given the considerable overlap between behavioral and chemical expressions of addiction, and previous research focusing on therapeutic alliance and chemical expressions of addiction, it is important to consider whether aspects of therapeutic alliance also are similarly related to success when treating behavioral expressions of addiction. Furthermore, if the important aspects of therapeutic alliance are similar when treating those suffering from behavioral and chemical expressions, then it is possible that those aspects of therapeutic alliance interact with the elements common to both types of expressions. One example element is impaired inhibition control (Zeng et al., 2024). Aspects of therapeutic alliance that can foster greater impulse control and self-discipline might be an important part of any addiction treatment, whether chemical or behavioral. Furthermore, with patients suffering from expressions of addiction from both categories (e.g., problem gambling and alcohol use disorder), there might be opportunities for clinicians to address common therapeutic alliance-related issues simultaneously (e.g., developing goals, relieving motivations for addictive behavior) and treat multiple expressions at the same time. On the other hand, if there are significant differences between what aspects of therapeutic alliance are related to success in treating chemical and behavioral expressions, then it is likely that those differences are related to specific features of different expressions (e.g., the direct pharmacological effects of some chemicals on the dopaminergic system versus the indirect effects associated with behavioral addictions (Alavi et al., 2012)). Studying such similarities, comparisons, and contrasts between the treatment of different expressions of addiction will allow clinicians who initially specialize in treating chemical expressions to expand their potential customer base to those suffering from behavioral expressions. They can learn what skills might be immediately transferable and what additional approaches they might have to add to their repertoire.

The Present Study

Located at a Hong Kong treatment center designed to treat a variety of addiction expressions and other mental health disorders, this study evaluates the impact of facets of therapeutic alliance (e.g., positive collaboration and trust between clients and clinicians, clinician encouragement and understanding of the patient) on addiction treatment outcomes. To assess changes in addiction severity, we observed patients' level of craving, loss of control, adverse consequences of addictive behaviors and desire to continue with the addictive behavior(s). This research contributes novel findings to the extant literature by examining the impact of therapeutic alliance on treatment seekers with a wide variety of behavioral expressions of addiction. We hypothesize that clients with stronger therapeutic alliance with their clinicians will show greater decreases in their levels of craving, loss of control, adverse consequences of addictive behavior(s), and desire to continue the addictive behavior(s) compared with clinician/client pairs with weaker evaluations of therapeutic alliance.

2. Methods

This study used an updated version of the data set employed by Shaffer et al. (2018). It includes an additional 186 enrolled clients and additional data collected from all 346 clients through the end of the project on December 31, 2019. This study presented initial findings about the demographics and psychological characteristics of addiction treatment seekers in Hong Kong. Consistent with the previous research protocol, this study involves all data collected from treatment seekers at the same three clinical addiction service locations that Shaffer et al. (2018)

studied previously, namely The Integrated Centre on Addiction Prevention and Treatment (ICAPT), the Even Center (EC), and the Alcohol Abuse Prevention and Treatment (AAPT) service. All three treatment services are under the management of The Tung Wah Groups of Hospitals (TWGHs), the largest local non-governmental organization providing medical, social, and educational services in Hong Kong.

In this study, we included all eligible participants who sought treatment from at least one of the aforementioned treatment centers between October 22, 2015 and December 31, 2019. There were four Inclusion criteria: (1) participants must be between 18 and 65 years, (2) evidence a sufficient cognitive capacity to participate in the study, (3) evidence language fluency in Cantonese Chinese, and (4) understand the nature of the study and provide written informed consent. We excluded from the study treatment seekers who presented with acute suicide risk or active psychotic symptoms. A total of 346 treatment seekers enrolled in this study (i.e., 72.1% of eligible treatment seekers), with primary expressions of addiction ranging from alcohol and drugs to gambling, shopping, and sexual behavior. Of these, for 97 participants (i.e., 26.3% of those enrolled, 20.2% of all eligible treatment seekers), we were able to obtain data about therapeutic alliance and addiction severity at two different time points, at intake and at a session close to the end of treatment. For Shaffer et al. (2018) and other future investigators who might adopt the same set of inclusion criteria, we recruited a group of participants from other service units at the TWGHs who received service such as interest classes or generic community support. This group represents a comparison group who did not report any history of addiction or other mental health problems. Because members of this group were not seeking treatment for addiction, we did not collect data about addiction severity or therapeutic alliance, and their data was not used in this study.

3. Procedures

During the initial face-to-face contact with a treatment seeker (i.e., the "intake session"), a therapist collected clinical information about each treatment seeker's presenting problems and psychosocial background using a standardized semi-structured interview format. The entire intake session took between 90 and 120 minutes; a paper assessment protocol packet guided the intake process. Before ending the session, therapists invited eligible treatment seekers to participate in the study by following a script detailed with study descriptions and procedures. With verbal consent for participation, research staff arranged a separate session with the treatment seekers for a comprehensive research assessment scheduled within one month of the intake session or before the next follow up session with the therapist.

Project staff members conducted these assessments. This process consisted of two parts: (1) a self-report questionnaire that required approximately 60 minutes, and (2) a selected battery of neuropsychological tests that required about 20 minutes to complete. To collect longitudinal data, there were four data collection time points: (1) the clinical intake session, (2) after every six months during the treatment period, (3) at treatment completion, and (4) at six months post-treatment. As an incentive for participation in the research, participants received supermarket vouchers for completing each research assessment. Our analyses examine the baseline data from the intake process and the data from the date of treatment completion.

4. Measures

4.1 Demographic and Clinical Information from the Intake Interview

Research staff collected age, gender, and years of formal education from participants. They also collected other demographic data and health information that were not used in this study. As a part of entering treatment, participants reported having experienced up to three expressions of addiction. Participants who listed multiple expressions ranked them as primary, secondary, and (if necessary) tertiary. We partitioned the participants into two subgroups based on their singular or primary addiction expression. The chemical expression group included those whose singular or primary expression of addiction involved psychoactive substances such as nicotine, alcohol, or other drugs. The behavioral expression group included participants whose singular or primary expression involved activities such as gambling, sexual behavior, Internet use, over-spending, and eating.

4.2 Therapeutic Alliance

We used the *Scale to Assess Therapeutic Relationships*

in Community Mental Health Care (STAR, McGuire-Snieckus et al. (2007)) to measure the quality of therapeutic alliance. The STAR has two parts, each with twelve items. Each item included a Likert scale ranging from 0 to 4, with 4 representing stronger therapeutic alliance. The clinician completes one part (STAR-C). The client completes the other (STAR-P). Investigators can separate each part into three blocks. The first two blocks on both parts are Positive Collaboration (PC, 6 items, e.g., shared understanding of goals, mutual openness, and trust) and Clinician Input (CI, 3 items, e.g., extent to which the clinician encourages and understands the client). The third block of the STAR-C is Emotional Difficulties (ED, 3 items, i.e., the clinician's feeling that they cannot empathize with the client). The third block of the STAR-P is Non-Supportive Clinician Input (NSCI, 3 items, i.e., patient's perception that the clinician is withholding truths and being authoritarian). The score for each block is based on the scores of their respective items, with higher scores meaning stronger therapeutic alliance. For comparison with the results in this study, in McGuire-Snieckus et al. (2007), where they validate the STAR-C and STAR-P, the means and standard deviations for the PC, CI, and ED scores of the STAR-C in their sample were 15.3 (4.0), 8.9 (1.6), and 7.4 (2.7), respectively. The corresponding means and standard deviations for the PC, CI, and NSCI scores of the STAR-P were 19.9 (6.7), 9.3 (3.0), and 9.3 (3.3). McGuire-Sneickus et al. reported test-retest reliabilities of $r = 0.76$ for the STAR-P and $r = 0.68$ for the STAR-C.

4.3 Addiction Severity

To capture the extent and change of the addiction problem, regardless of actual addictive behavior, we constructed a four-item "addiction characteristics rating scale" (ACRS). The four items on this scale were the core addiction characteristics highlighted in the syndrome model. These items include: (1) craving for the addictive behavior, (2) feeling of loss of control over the addictive behavior, (3) continued engagement in the addictive behavior despite negative consequences, and (4) sense of desirable subjective shift when engaging with the addictive behavior. After each session, the clinicians rated clients on each of the four characteristics using a Likert-type measure with scores ranging from 0 to 9.

4.4 Choice of Time Points

The data set includes STAR-P and STAR-C therapeutic alliance scores and addiction severity measures obtained at baseline (i.e., intake), at each of the first three sessions, and then at every third session after that starting with the sixth. For our analyses, we use two time points. The first time point is at baseline. The second time point is the latest measurement before the client's date of treatment termination. If a client terminated treatment the day of the tenth session, for example, then we use the measurements from the ninth session for analysis. If a client terminated the day of the ninth session, then we will use the data from the sixth session. We chose the second time point to allow for the possibility of studying early changes in therapeutic alliance (i.e., in the first three sessions) and then to allow for the future possibility of studying changes in therapeutic alliance during treatment. Collecting data every three sessions balanced wanting to collect as many data points as possible with not risking the clients having negative opinions about the data collection that adversely affect either the data collection process or the treatment process itself. We believe that the actual event of terminating treatment can influence clinicians' responses on the STAR-C, the client's responses on the STAR-P, and the estimates or quantification of the client's addiction severity. Using the latest measurements before the date of termination allows us to observe the maximum amount of therapeutic alliance change and addiction severity possible while avoiding the effects of the singular event of ending treatment.

4.5 Data Analyses

We performed the data analyses using the statistical programming language R (version 4.0.0, R Core Team, 2020). Our analytic sample consisted of the 97 participants for whom we had complete data (i.e., treatment group, all STAR and ACRS scores at both time points).

Descriptive statistics. We calculated separate descriptive statistics for the chemical and behavioral groups. We calculated the mean and standard deviations for age and numbers of years of education. We also found the percentages of men and women. For both time points, we calculated the mean and standard deviations of each of the six STAR scores and the four

ACRS scores.

Comparing the chemical and behavioral groups. For each of the six therapeutic alliance measures and four measures of addiction severity, for both time points, we conducted Welch *t*-tests to determine if the average of the values from the chemical group was meaningfully different from the average for the behavioral group.

Regression analyses using the therapeutic alliance scores at baseline. Next, we explored possible additional associations between therapeutic alliance at the beginning of treatment and addiction severity. For the four addiction severity scores (i.e., craving, loss of control, consequences, and desirable shift), we conducted OLS regression analyses with severity score at the second time point as the response variable and the severity score at baseline and the six therapeutic alliance sub-scores at baseline as the covariates. For these initial analyses, we treated the participants as one combined cohort. We used the *t*-scores of the coefficients to determine whether the therapeutic alliance scores are statistically significant predictors of the severity scores at the end of treatment.

Regression models with therapeutic alliance scores at both time points. Next, we explored possible additional effects of therapeutic alliance at baseline on addiction severity. For each of the four models in the previous block we added terms for the therapeutic alliance sub-scores (i.e., three from the STAR-C, three from the STAR-P) at the second time point. Again, we used the *t*-scores of the coefficients to determine which terms in the models are statistically significant. Some of the measures' distributions were left skewed (i.e., more higher scores). However, because the measures were sums of single-digit scores and had strict minimum and maximum values, we considered linear models and normal-distribution-based methods appropriate. Because our analytic sample had no missing STAR or ACRS, we included all of this data in all of the regression analyses described above.

Because these are exploratory analyses, we used a moderate statistical significance threshold of $\alpha = 0.05$ for all tests. Readers should not use any *p*-values we list below to judge whether one result is more meaningful or less meaningful than another. More detailed statistical output can be made available to interested readers upon request.

5. Results

5.1 Comparing Participants: Chemical and Behavioral Groups

A total of 346 treatment seekers consented to enroll in this study (i.e., 72.1% of eligible and consecutive treatment seekers). From this group, we removed 82 participants from further analysis because they did not provide responses to the STAR or ACRS during their initial intake session. Of the remaining 264 participants, we removed 167 participants who either did not have a termination date or were missing at least one of the STAR or ACRS scores at one of the two time points. Of the remaining 97 participants, six qualified for the chemical addiction group (i.e., 83.3% male, with a mean age of 44.2 (SD = 6.0). Five of these participants listed their years of education (i.e., mean = 12.4, SD = 5.5). Ninety-one participants (i.e., 73.6% male, with a mean age of 39.3 (SD = 11.6)) qualified for the behavioral addiction group. Eighty-nine of these participants listed their number of years of education (i.e., mean = 13.3, SD = 3.6). The 97 participants each evidenced STAR-C, STAR-P, and ACRS scores at two time points (i.e., a study wide completion rate: 97/346 = 28.0%). Only one participant, a member of the behavioral group, reported a secondary expression of addiction. The other 96 only reported a primary expression. The most common primary expressions were sex ($n = 34$), gambling ($n = 27$), spending ($n = 13$), and stealing ($n = 13$).

To determine whether the final sample was systematically different from the participants that we removed for incomplete or missing data, we used Welch *t*-tests in all but one analysis. The singular exception was a comparison of gender across groups, for which we used a Fisher's exact test. We compared the distributions of age, years of education, gender, baseline STAR scores, and baseline ACRS scores of the 97 participants in our final sample to the corresponding distributions of the 249 participants that we removed. We compared the distributions of the above demographics and measures for the six members of the chemical group in our final sample to the corresponding distributions for the 72 participants from the chemical group we removed. We also compared the distributions for the 91 members of the behavioral group in our final sample to the corresponding distributions for the 177 members of the behavioral group we removed. The

only statistically significant comparison (i.e., with $p < 0.05$) was that among those whose primary expression was chemical, the ages of those we had the data to include in the study were generally speaking older than those we removed from consideration. Summary statistics for participants included in the final sample are in **Table 1**. Comparisons between the participants we included and the participants we removed are in Tables S1 through S3 in an online supplement.

Next, we conducted Welch *t*-tests comparing the distributions of the scores from those in the chemical group to the corresponding scores in the behavioral group. Of these twenty comparisons, only one showed a statistically significant difference: the Emotional Difficulties sub-score on the STAR-C which clinician participants completed near termination ($p < 0.001$). In particular, clinicians' scores based on pairings with clients in the chemical group were significantly lower than clinicians' scores based on pairings with clients in the behavioral group (i.e., 9.00 versus 10.14, respectively, magnitude of Cohen's *d*: 0.70, $p < 0.001$). That is, clinicians responding about time spent with those in the chemical group more often agreed with the following three statements: (1) "I feel that the patient rejects me as a clinician." (2) "I feel inferior to my patient." (3) "It is difficult for me to empathize with or relate to my patient's problem."

5.2 Regression Analyses Using Therapeutic Alliance Scores at Baseline

For each of the ACRS measures, we fit linear models with the measurement near termination as the response variable and the measurement at intake and the six STAR sub-scores as the seven covariates (see **Table 2**). For each of the four ACRS measures, severity level at baseline was a significant predictor of severity level near the end of treatment. For all four models, the ACRS sub-score at baseline was a statistically significant predictor for the corresponding ACRS sub-score near the end of treatment. Higher baseline scores on the Positive Collaboration sub-score of the STAR-P was associated with a decrease in the Continued Engagement sub-score ($t(89) = -3.08$, magnitude of the standardized regression coefficient: 0.38, $p = 0.003$). The Positive Collaboration sub-score at baseline did not predict any of the other three ACRS scores near the end of treatment, and the other STAR-P and STAR-C sub-scores did not significantly predict any of the four ACRS scores near the end of treatment (i.e., $p > 0.05$).

Table 1. Changes in STAR-P, STAR-C, and ACRS Scores from Intake to Near Termination for the Behavioral and Chemical Groups.

			Chemical		Behavioral					
Time	Set	Score	Mean	SD	Mean	SD	*t*	*df*	*p*	
		n	6		91					
Intake	STAR-P	PC	19.00	3.41	20.01	3.40	-0.70	5.68	0.51	
		CI	9.83	1.83	10.15	1.67	-0.42	5.56	0.69	
		NCSI	9.33	2.16	9.33	2.37	0.00	5.82	1.00	
	STAR-C	PC	20.00	4.43	17.99	3.17	1.09	5.34	0.32	
		CI	10.67	1.97	9.78	1.53	1.08	5.41	0.33	
		ED	8.67	1.37	9.49	1.39	-1.44	5.71	0.20	
	ACRS	Cr	6.00	1.10	6.01	2.31	-0.02	8.33	0.98	
		LC	5.33	1.03	5.79	2.67	-0.91	10.26	0.39	
		Co	6.33	1.86	5.37	2.86	1.17	6.67	0.28	
		DS	6.00	2.10	5.42	2.55	0.65	6.02	0.54	
Near Termination	STAR-P	PC	21.83	3.49	22.33	2.66	-0.34	5.39	0.75	
		CI	11.33	0.82	10.99	1.42	0.94	7.17	0.38	
		NCSI	7.83	2.40	9.12	2.48	-1.27	5.73	0.25	
	STAR-C	PC	20.83	2.23	20.45	3.87	0.38	7.18	0.71	
		CI	10.83	0.98	10.63	1.78	0.47	7.38	0.65	
		ED	9.00	0.00	10.14	1.66	-6.55	90.00	0.00	*

Continuation Table:

Time	Set	Score	Chemical Mean	Chemical SD	Behavioral Mean	Behavioral SD	*t*	*df*	*p*
		n	6		91				
	ACRS	Cr	4.50	1.38	3.19	2.50	2.12	7.39	0.07
		LC	4.00	2.00	2.73	2.45	1.49	6.04	0.19
		Co	3.83	2.14	2.63	2.54	1.32	5.97	0.23
		DS	3.67	1.97	3.16	2.57	0.59	6.19	0.57

PC: Positive Collaboration
CI: Clinician Input
ED: Emotional Difficulties
NSCI: Non-Supportive Clinician Input
Cr: Craving for the Addictive Behavior
LC: Loss of Control over the Addictive Behavior
Co: Continued Engagement Despite Negative Consequences
DS: Sense of Subjective Desirable Shift
* Significant at the $\alpha = 0.05$ level.

Table 2. Regression models with therapeutic alliance scores at baseline.

ACRS Score	Measure		Coeff.	SE	*t*	*p*	
Craving	Intercept		1.55	2.74	0.57	0.572	
	ACRS Score at Baseline		0.38	0.11	3.35	0.001	*
	STAR-P	Positive Collaboration	0.05	0.10	0.46	0.647	
	STAR-P	Clinician Input	-0.17	0.21	-0.81	0.421	
	STAR-P	Non-Supp. Clin. Input	0.04	0.11	0.41	0.683	
	STAR-C	Positive Collaboration	0.12	0.12	1.04	0.303	
	STAR-C	Clinician Input	-0.20	0.26	-0.77	0.446	
	STAR-C	Emotional Difficulties	-0.06	0.19	-0.30	0.762	
Loss of Control	Intercept		3.25	2.56	1.27	0.208	
	ACRS Score at Baseline		0.36	0.10	3.66	0.000	*
	STAR-P	Positive Collaboration	-0.07	0.10	-0.69	0.494	
	STAR-P	Clinician Input	-0.12	0.20	-0.57	0.567	
	STAR-P	Non-Supp. Clin. Input	-0.10	0.10	-0.96	0.338	
	STAR-C	Positive Collaboration	0.12	0.12	1.06	0.290	
	STAR-C	Clinician Input	-0.18	0.25	-0.74	0.461	
	STAR-C	Emotional Difficulties	0.05	0.18	0.3	0.767	
Continued Engagement	Intercept		4.52	2.37	1.91	0.059	
	ACRS Score at Baseline		0.42	0.08	5.20	0.000	*
	STAR-P	Positive Collaboration	-0.29	0.09	-3.08	0.003	*
	STAR-P	Clinician Input	0.14	0.19	0.77	0.441	
	STAR-P	Non-Supp. Clin. Input	-0.04	0.10	-0.39	0.700	
	STAR-C	Positive Collaboration	0.18	0.11	1.69	0.094	
	STAR-C	Clinician Input	-0.44	0.23	-1.93	0.057	
	STAR-C	Emotional Difficulties	0.16	0.17	0.96	0.341	
Desirable Shift	Intercept		5.05	2.75	1.84	0.070	
	ACRS Score at Baseline		0.33	0.10	3.16	0.002	*

Continuation Table:

ACRS Score		Measure	Coeff.	SE	*t*	*p*
	STAR-P	Positive Collaboration	-0.05	0.11	-0.48	0.630
	STAR-P	Clinician Input	-0.16	0.21	-0.74	0.464
	STAR-P	Non-Supp. Clin. Input	0.00	0.11	0.01	0.991
	STAR-C	Positive Collaboration	0.07	0.12	0.54	0.590
	STAR-C	Clinician Input	-0.25	0.26	-0.97	0.335
	STAR-C	Emotional Difficulties	0.02	0.19	0.11	0.915

* Significant at the $\alpha = 0.05$ level.

Using the therapeutic alliance scores at both time points, for all four ACRS sub-scores, the models containing both the STAR-P and STAR-C scores at baseline and the STAR-P and STAR-C scores near the end of treatment, the only statistically significant predictors for the ACRS sub-scores near the end of treatment were the corresponding ACRS sub-scores at baseline (see **Table 3**).

Table 3. Regression models for the ACRS sub-scores for craving, loss of control, continued engagement, and desirable shift, with TA scores at both time points.

ACRS Subscore	Time	STARsubscore		Coeff.	SE	*t*	*p*	
Craving	Intercept			4.12	3.31	1.25	0.216	
	ACRS Score at Baseline			0.33	0.12	2.82	0.006	*
	Baseline	STAR-P	PC	0.11	0.12	0.89	0.376	
	Baseline	STAR-P	CI	-0.24	0.23	-1.02	0.311	
	Baseline	STAR-P	NSCI	0.11	0.14	0.81	0.421	
	Baseline	STAR-C	PC	0.09	0.13	0.65	0.519	
	Baseline	STAR-C	CI	-0.11	0.27	-0.41	0.685	
	Baseline	STAR-C	ED	0.03	0.21	0.15	0.884	
	Near Term.	STAR-P	PC	-0.06	0.14	-0.40	0.689	
	Near Term.	STAR-P	CI	0.10	0.27	0.36	0.723	
	Near Term.	STAR-P	NSCI	-0.11	0.13	-0.85	0.399	
	Near Term.	STAR-C	PC	0.13	0.15	0.87	0.388	
	Near Term.	STAR-C	CI	-0.40	0.32	-1.25	0.215	
	Near Term.	STAR-C	ED	-0.16	0.20	-0.81	0.419	
Loss of Control	Intercept			5.81	3.11	1.87	0.065	
	ACRS Score at Baseline			0.30	0.11	2.85	0.006	*
	Baseline	STAR-P	PC	0.01	0.12	0.12	0.906	
	Baseline	STAR-P	CI	-0.17	0.23	-0.74	0.462	
	Baseline	STAR-P	NSCI	-0.05	0.14	-0.38	0.703	
	Baseline	STAR-C	PC	0.10	0.13	0.76	0.447	
	Baseline	STAR-C	CI	-0.07	0.26	-0.28	0.777	
	Baseline	STAR-C	ED	0.11	0.21	0.51	0.609	
	Near Term.	STAR-P	PC	-0.02	0.14	-0.12	0.902	
	Near Term.	STAR-P	CI	-0.11	0.26	-0.42	0.675	
	Near Term.	STAR-P	NSCI	-0.04	0.13	-0.29	0.773	
	Near Term.	STAR-C	PC	0.11	0.14	0.73	0.465	
	Near Term.	STAR-C	CI	-0.44	0.31	-1.39	0.167	
	Near Term.	STAR-C	ED	-0.05	0.20	-0.27	0.791	

ACRS Subscore	Time	STAR subscore		Coeff.	SE	*t*	*p*	
Continued. Engagement	Intercept			5.78	2.86	2.02	0.047	*
	ACRS Score at Baseline			0.41	0.09	4.78	0.000	*
	Baseline	STAR-P	PC	-0.20	0.11	-1.85	0.068	
	Baseline	STAR-P	CI	0.05	0.21	0.23	0.820	
	Baseline	STAR-P	NSCI	-0.06	0.13	-0.49	0.628	
	Baseline	STAR-C	PC	0.22	0.12	1.84	0.069	
	Baseline	STAR-C	CI	-0.37	0.24	-1.52	0.133	
	Baseline	STAR-C	ED	0.13	0.19	0.66	0.509	
	Near Term.	STAR-P	PC	0.09	0.13	0.70	0.488	
	Near Term.	STAR-P	CI	-0.19	0.24	-0.78	0.439	
	Near Term.	STAR-P	NSCI	0.04	0.12	0.34	0.733	
	Near Term.	STAR-C	PC	0.00	0.13	0.02	0.983	
	Near Term.	STAR-C	CI	-0.32	0.28	-1.16	0.250	
	Near Term.	STAR-C	ED	0.04	0.18	0.21	0.833	
Desirable Shift	Intercept			7.49	3.34	2.24	0.028	*
	ACRS Score at Baseline			0.27	0.11	2.49	0.015	*
	Baseline	STAR-P	PC	0.07	0.12	0.57	0.567	
	Baseline	STAR-P	CI	-0.31	0.24	-1.32	0.191	
	Baseline	STAR-P	NSCI	0.02	0.14	0.11	0.917	
	Baseline	STAR-C	PC	0.08	0.14	0.59	0.559	
	Baseline	STAR-C	CI	-0.14	0.27	-0.50	0.621	
	Baseline	STAR-C	ED	0.01	0.21	0.05	0.962	
	Near Term.	STAR-P	PC	-0.06	0.14	-0.40	0.687	
	Near Term.	STAR-P	CI	0.10	0.28	0.37	0.715	
	Near Term.	STAR-P	NSCI	-0.05	0.13	-0.39	0.696	
	Near Term.	STAR-C	PC	0.02	0.15	0.11	0.916	
	Near Term.	STAR-C	CI	-0.44	0.32	-1.38	0.171	
	Near Term.	STAR-C	ED	0.06	0.20	0.31	0.758	

PC: Positive Collaboration
CI: Clinician Input
ED: Emotional Difficulties
NSCI: Non-Supportive Clinician Input
* Significant at the $\alpha = 0.05$ level.

6. Discussion

This study evaluated the influence of therapeutic alliance on addiction severity during the course of treatment at a comprehensive Hong Kong treatment center. This study contributes important and novel findings by including a diverse group of addiction treatment-seekers. At the outset of this project, we hypothesized that strong therapeutic alliance between the client and clinician would be associated with decreased addiction severity during the course of treatment compared to those participants with weaker therapeutic alliance. The results provided partial support for this hypothesis. Stronger therapeutic alliance from the client's point of view at intake was indeed associated with reductions of addictive behavior despite negative consequences at termination. We observed this finding regardless of addiction expression.

Therapeutic Alliance: The results of this study reveal that, as expected, a stronger therapeutic alliance at the beginning of treatment, from the viewpoint of the client suffering with addiction, was negatively associated with continued engagement with the object or expression of addiction. That therapeutic alliance

from the perspective of the clinician had no significant impact on the addiction severity at termination suggests that clients form a lasting impression early in the treatment process. As mentioned above, researchers such as Connors et al. (1997) and Bachelor (2013) have observed associations between clients' assessments of therapeutic alliance and treatment outcomes.

For the present study, we did, however, expect that stronger therapeutic alliance would be associated with all four of the addiction severity subscales, and that the therapeutic alliance at treatment termination would be associated with addiction severity. However, this study did not support these hypotheses. It is possible that there is some redundancy between the STAR scores or between the values of a single score at the two time points, generating these unexpected findings. Because we did not pre-register any model-building procedures (e.g., principal component analysis, stepwise regression), we did not attempt to fit any pared down statistical models. It also is possible that we would have identified non-linear relationships between therapeutic alliance and addiction severity if we had assessed these relationships at more than two time points and then examined the change in therapeutic alliance during the course of treatment. Previous work evaluated the changes in therapeutic alliance throughout treatment and how that related to treatment outcomes. For example, Hogue et al. (2006) videotaped sessions and had objective coders rate the therapeutic alliance between the client and clinicians. They reported that adolescents evidenced therapeutic alliance that increased over time had better treatment outcomes in substance use treatment. These findings might indicate that it is important to consider how the therapeutic alliance changes over time, beyond intake and termination, relates to treatment outcomes.

Therapeutic Alliance Differences between Behavioral and Chemical Expressions of Addiction

The syndrome model of addiction posits that addiction is a primary disorder with multiple opportunistic expressions (Shaffer et al., 2004). This model rests on evidence of common neurological antecedents, shared social risk factors and shared psychological risk factors between chemical and behavioral forms of addiction (Shaffer et al., 2018). Although we designed this study to attract participants primarily interested in treatment for behavioral expressions of addiction, six participants did seek treatment for chemical expressions of addiction. Unexpectedly, we observed a difference between the behavioral and chemical expression groups: clinicians treating patients with chemical expressions of addiction reported feeling significantly more rejected and inferior to their patients at termination compared to those treating patients with behavioral addictions. It is possible that participants who sought treatment for behavioral expressions of addiction entered treatment healthier and more ready to respond to clinician input. Other researchers have reported associations between emotional dysregulation and patients with chemical-based addictions and behavioral-based addictions, often pointing to a negative relationship between the two (Parolin et al., 2017; Mackesy-Amiti & Donenberg, 2020; Pettorruso et al., 2020; Torrado et al., 2020). These studies are consistent with the syndrome model of addiction. Both the chemical and behavioral groups faced emotional instability and dysregulation.

7. Limitations

As with any study, this research has limitations. Four primary limitations might have impacted the present findings. First, there were only six participants remaining in the chemical group at treatment termination. This was the result of participants failing to complete all measures. Future work should include clinical programs designed to attract participants interested in treatment for chemical expressions of addiction. Researchers can then replicate the present study with a robust sample representing both chemical and behavioral expressions and make observations about the similarities and differences in the role of therapeutic alliance in the two groups' members' treatment.

Second, participants determined their primary expression of addiction -- if they had more than one expression from which to choose. Participants might not be able to accurately determine at intake which expression of addiction is causing them the most problems. Since comorbidity of addictive and mental health disorders is highly prevalent and individuals often have one primary mental health issue with an addictive behavior as a secondary or associated

problem (Kessler et al., 1996), it is important for clinicians to consider all expressions of addiction and comorbidity that an individual is experiencing. Future work should employ a more systematic method to determine the primary expression of addiction and consider the presence, effects, and interference of a secondary expression when applicable.

Third, our data set did not include counselor years of experience, their preferred treatment methods, or the treatment methods used in the interactions with these clients. Previous research has noted that therapeutic alliance can vary among counselors using the same treatment techniques (e.g., Moyers et al., 2005, motivational interviewing) and between treatment techniques more generally (e.g., Carroll et al., 1997). It is possible that treatment differences contributed to therapeutic alliance differences, and in turn, treatment outcome differences.

Fourth, and finally, we only assessed the impact of therapeutic alliance on addiction severity scores; we did not investigate other addiction-related outcomes (e.g., treatment duration), co-morbid mental disorders (e.g., depression, anxiety) or other health-related subscales (e.g., wellbeing, stress, coping strategies, social support). Previous work has used some of these outcomes when evaluating the impact of therapeutic alliance on addiction treatment. Meier et al. (2006) reported that clinician's ratings of therapeutic alliance predicted treatment duration in a sample of adults entering residential treatment for drug use. Those with higher clinician-rated therapeutic alliance scores had a longer treatment duration, even when controlling for psychological wellbeing, treatment motivation and readiness, coping strategies and attachment style. Other work has used psychological distress, motivation, self-efficacy, coping skills, and commitment to Alcoholics Anonymous/Narcotics Anonymous as outcome measures when assessing therapeutic alliance. Urbanoski et al. (2012) reported that greater therapeutic alliance was associated with decreased psychological distress over the course of treatment. Future research needs to replicate the present study using additional mental health outcomes.

8. Conclusion

The present findings advance the addiction treatment literature by examining the impact of therapeutic alliance among a sample of treatment-seeking individuals experiencing a wide variety of expressions of addiction. To the best of our knowledge, this study represents the first to examine therapeutic alliance and its relationship to the treatment of behavioral expressions addiction in general. Previous work focusing on therapeutic alliance and addiction has been based solely on chemical expressions of addiction (e.g., alcohol and other drug use). Those studies usually focused on only one expression of addiction at a time. This study is the first to investigate therapeutic alliance among a sample of addiction treatment-seekers where most clients reported a primary addiction that is behavioral rather than chemical. These findings have important implications for addiction treatment: the results suggest that clients seeking treatment for behavioral addiction need to develop a strong alliance with their treatment provider early in the process of treatment to maximize the effectiveness of such treatment. Although our study does not include two large chemical and behavioral groups side-by-side, our results do suggest that therapeutic alliance is important for those with behavioral expressions of addiction, just as it is for those with chemical expressions of addiction. Despite us here and others elsewhere separating chemical and behavioral expressions, in some respects, such as having a client and therapist establish positive collaboration and common goals, it might be correct to consider therapeutic alliance in addiction treatment as a singular concept, regardless of the specific expression.

Future research should also expand this methodology by examining the influence of therapeutic alliance at various time points during treatment. For example, if the counselor and client need to spend time on administrative details (e.g., insurance, protocols for scheduling future appointments), then it might take more sessions (e.g., five, according to Horvath (2000)) to achieve a strong therapeutic alliance. As for specific techniques for improving therapeutic alliance, they are likely counselor- and client-dependent (e.g., based on the treatment style – CBT versus motivational interviewing versus something else) and beyond the scope of this study. In the meantime, researchers should continue to explore the impact of therapeutic alliance for clients with a tapestry of addiction-related problems to determine how it impacts both addiction-related and other mental health outcomes over time.

Statements Regarding Ethical Considerations

Informed consent was obtained from all individual participants included in the study. All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards.

Research Ethics

The research ethics committee of ICAPT, comprised of members who were not involved in the daily operation of the three addiction treatment centers, reviewed and approved the protocol and procedures for this study.

Data Availability and Open Science

The data that support the findings of this study are available from the corresponding author upon request.

The preregistration and a transparent change document for this study are on the Open Science Framework at https://osf.io/s83r6/.

References

[1] Alavi, S. S., Ferdosi, M., Jannatifard, F., Eslami, M., Alaghemandan, H., & Setare, M. (2012). Behavioral Addiction versus Substance Addiction: Correspondence of Psychiatric and Psychological Views. *International Journal of Preventive Medicine, 3*(4), 290-294.

[2] Ardito, R. B., & Rabellino, D. (2011). Therapeutic Alliance and Outcome of Psychotherapy: Historical Excursus, Measurements, and Prospects for Research. *Frontiers in Psychology, 2*. https://doi.org/10.3389/fpsyg.2011.00270

[3] Bachelor, A. (2013). Clients' and Therapists' Views of the Therapeutic Alliance: Similarities, Differences and Relationship to Therapy Outcome: Clients' and Therapists' Alliances. *Clinical Psychology & Psychotherapy, 20*(2), 118-135. https://doi.org/10.1002/cpp.792

[4] Bordin, E. S. (1979). The generalizability of the psychoanalytic concept of the working alliance. *Psychotherapy: Theory and Practice, 16*(3), 252-260. https://doi.org/10.1037/h0085885

[5] Carroll, K. M., Nich, C., & Rounsaville, B. J. (1997). Contribution of the therapeutic alliance to outcome in active versus control psychotherapies. *Journal of Consulting and Clinical Psychology*, 65(3), 510-514. https://doi.org/10.1037/0022-006X.65.3.510

[6] Connors, G. J., Carroll, K. M., DiClemente, C. C., Longabaugh, R., & Donovan, D. M. (1997). The therapeutic alliance and its relationship to alcoholism treatment participation and outcome. *Journal of Consulting and Clinical Psychology, 65*(4), 588-598. https://doi.org/10.1037/0022-006X.65.4.588

[7] Del Re, A. C., Flückiger, C., Horvath, A. O., Symonds, D., & Wampold, B. E. (2012). Therapist effects in the therapeutic alliance–outcome relationship: A restricted-maximum likelihood meta-analysis. *Clinical Psychology Review, 32*(7), 642-649. https://doi.org/10.1016/j.cpr.2012.07.002

[8] Dowling, N. A., & Ćosić, S. (2011). Client Engagement Characteristics Associated with Problem Gambling Treatment Outcomes. *International Journal of Mental Health and Addiction, 9*(6), 656-671. https://doi.org/10.1007/s11469-010-9298-x

[9] Flückiger, C., Del Re, A. C., Wampold, B. E., & Horvath, A. O. (2018). The alliance in adult psychotherapy: A meta-analytic synthesis. *Psychotherapy, 55*(4), 316-340. https://doi.org/10.1037/pst0000172

[10] Glazer, S. S., Galanter, M., Megwinoff, O., Dermatis, H., & Keller, D. S. (2003). The role of therapeutic alliance in network therapy: A family and peer support-based treatment for cocaine abuse. *Substance Abuse, 24*(2), 93-100. https://doi.org/10.1080/08897070309511537

[11] Hogue, A., Dauber, S., Stambaugh, L. F., Cecero, J. J., & Liddle, H. A. (2006). Early therapeutic alliance and treatment outcome in individual and family therapy for adolescent behavior problems. *Journal of Consulting and Clinical Psychology, 74*(1), 121-129. https://doi.org/10.1037/0022-006X.74.1.121

[12] Horvath, A. O. (2000). The therapeutic relationship: From transference to alliance. *Journal of Clinical Psychology, 56*(2), 163-173. https://doi.org/10.1002/(SICI)1097-4679(200002)56:2<163::AID-JCLP3>3.0.CO;2-D

[13] Horvath, A. O., Del Re, A. C., Flückiger, C., & Symonds, D. (2011). Alliance in individual psychotherapy. *Psychotherapy, 48*(1), 9-16. https://doi.org/10.1037/a0022186

[14] Kessler, R. C., Nelson, C. B., McGonagle, K. A., Edlund, M. J., Frank, R. G., & Leaf, P. J. (1996). The epidemiology of co-occurring addictive and mental disorders: implications for prevention and service utilization. *The American Journal of Orthopsychiatry, 66*(1), 17-31.

[15] Mackesy-Amiti, M. E., & Donenberg, G. (2020). Negative affect and emotion dysregulation among people who inject drugs: An ecological momentary assessment study. *Psychology of Addictive Behaviors, 34*(6), 650-659. https://doi.org/10.1037/adb0000577

[16] Martin, D. J., Garske, J. P., & Davis, M. K. (2000). Relation of the therapeutic alliance with outcome and other variables: a meta-analytic review. *Journal of Consulting and Clinical Psychology, 68*(3), 438-450. https://doi.org/10.1037/0022-006X.68.3.438

[17] McGuire-Snieckus, R., McCabe, R., Catty, J., Hansson, L., & Priebe, S. (2007). A new scale to assess the therapeutic relationship in community mental health care: STAR. *Psychological Medicine, 37*(01), 85. https://doi.org/10.1017/S0033291706009299

[18] Meier, P. S., Donmall, M. C., McElduff, P., Barrowclough, C., & Heller, R. F. (2006). The role of the early therapeutic alliance in predicting drug treatment dropout. *Drug and Alcohol Dependence, 83*(1), 57-64. https://doi.org/10.1016/j.drugalcdep.2005.10.010

[19] Moyers, T. B., Miller, W. R., & Hendrickson, S. M. L. (2005). How does motivational interviewing work? Therapist interpersonal skill predicts client involvement within motivational interviewing sessions. *Journal of Consulting and Clinical Psychology, 73*(4), 590-598. https://doi.org/10.1037/0022-006X.73.4.590

[20] Parolin, M., Simonelli, A., Cristofalo, P., Sacco, M., Bacciardi, S., Maremmani, A. G. I., Cimino, S., Trumello, C., & Cerniglia, L. (2017). Drug addiction and emotional dysregulation in young adults. *Heroin Addiction and Related Clinical Problems, 19*(3), 37-48.

[21] Pettorruso, M., Valle, S., Cavic, E., Martinotti, G., di Giannantonio, M., & Grant, J. E. (2020). Problematic Internet use (PIU), personality profiles and emotion dysregulation in a cohort of young adults: trajectories from risky behaviors to addiction. *Psychiatry Research, 289*, 113036. https://doi.org/10.1016/j.psychres.2020.113036

[22] R Core Team. (2020). *R: A Language and Environment for Statistical Computing*. In (Version 4.0.0) R Foundation for Statistical Computing. http://www.R-project.org

[23] Shaffer, H. J., LaPlante, D. A., LaBrie, R. A., Kidman, R. C., Donato, A. N., & Stanton, M. V. (2004). Toward a Syndrome Model of Addiction: Multiple Expressions, Common Etiology. *Harvard Review of Psychiatry, 12*(6), 367-374. https://doi.org/10.1080/10673220490905705

[24] Shaffer, H. J., Tom, M. A., Wiley, R. C., Wong, M. F. Y., Chan, E. M. L., Cheng, G. L. F., Lo, C. K. M., Ma, E. K. Y., Wong, R. H. Y., & Lee, M. (2018). Using the Syndrome Model of Addiction: a Preliminary Consideration of Psychological States and Traits. *International Journal of Mental Health and Addiction, 16*(6), 1373-1393. https://doi.org/10.1007/s11469-018-9952-2

[25] Torrado, M., Bacelar-Nicolau, L., Skryabin, V., Teixeira, M., Eusébio, S., & Ouakinin, S. (2020). Emotional dysregulation features and problem gambling in university students: a pilot study. *Journal of Addictive Diseases, 38*(4), 550-566. https://doi.org/10.1080/10550887.2020.1800889

[26] Urbanoski, K. A., Kelly, J. F., Hoeppner, B. B., & Slaymaker, V. (2012). The role of therapeutic alliance in substance use disorder treatment for young adults. *Journal of Substance Abuse Treatment, 43*(3), 344-351. https://doi.org/10.1016/j.jsat.2011.12.013

[27] Zeng, X., Han, X., Zheng, D., Jiang, P., & Yuan, Z. (2024). Similarity and difference in large-scale functional network alternations between behavioral addictions and substance use disorder: a comparative meta-analysis. *Psychological Medicine, 54*(3), 473-487. https://doi.org/10.1017/S0033291723003434

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Supplemental Tables

Table S1. Comparing the participants in our final sample to those we removed from the data set.

	In the final sample			Not in the final sample					
	Mean	*SD*	*n*	Mean	*SD*	*n*	*t*	*df*	*p*
Age	39.57	11.38	97	36.94	11.45	249	1.92	176.12	0.056
Years of Education	13.21	3.67	94	13.25	3.48	233	-0.09	164.23	0.927
Male			72			197			0.388
Female			25			52			
Total			97			249			
STAR-P									
Positive Collaboration	19.95	3.39	97	19.73	3.59	164	0.50	210.97	0.616
Clinician Input	10.13	1.67	97	9.93	1.94	166	0.91	225.08	0.365
Non-Supportive Clinician Input	9.33	2.34	97	9.10	2.35	165	0.78	201.63	0.439
STAR-C									
Positive Collaboration	18.11	3.27	97	18.49	3.24	166	-0.90	199.53	0.369
Clinician Input	9.84	1.57	97	10.07	1.69	166	-1.15	213.23	0.251
Emotional Difficulties	9.44	1.40	97	9.58	1.74	165	-0.71	235.76	0.481
ACRS Score									
Craving	6.01	2.25	97	6.31	2.16	167	-1.04	193.84	0.299
Loss of Control	5.76	2.60	97	6.16	2.45	166	-1.21	191.77	0.227
Continued Engagement	5.43	2.81	97	5.91	2.57	167	-1.37	186.11	0.172
Desirable Shift	5.45	2.52	97	5.77	2.49	166	-0.97	198.94	0.333

* Significant at the $\alpha = 0.05$ level.
The *p*-values for age, years of education, STAR-P scores, STAR-C scores, and ACRS scores are from Welch *t*-tests.
The *p*-value for gender is from a Fisher's exact test.

Table S2. Comparing the chemical group participants in our final sample to chemical group participants we removed from the data set.

	In the final sample			Not in the final sample						
	Mean	*SD*	*n*	Mean	SD	*n*	*t*	*df*	*p*	
Age	44.17	6.01	6	37.31	8.91	72	2.57	6.98	0.037	*
Years of Education	12.40	5.46	5	12.75	3.43	64	-0.14	4.25	0.894	
Male			5			65			0.490	
Female			1			7				
Total			6			72				
STAR-P										
Positive Collaboration	19.00	3.41	6	19.06	3.88	36	-0.04	7.34	0.972	
Clinician Input	9.83	1.83	6	9.53	1.93	36	0.37	6.99	0.719	
Non-Supportive Clinician Input	9.33	2.16	6	8.89	2.24	36	0.46	6.92	0.657	

Continuation Table:

	In the final sample			Not in the final sample					
	Mean	*SD*	*n*	Mean	SD	*n*	*t*	*df*	*p*
STAR-C									
Positive Collaboration	20.00	4.43	6	18.72	3.46	36	0.67	6.06	0.525
Clinician Input	10.67	1.97	6	9.86	1.46	36	0.96	5.95	0.374
Emotional Difficulties	8.67	1.37	6	9.28	1.85	36	-0.96	8.39	0.364
ACRS Score									
Craving	6.00	1.10	6	5.81	2.23	36	0.33	13.36	0.743
Loss of Control	5.33	1.03	6	5.28	2.60	36	0.09	18.27	0.928
Continued Engagement	6.33	1.86	6	5.64	2.37	36	0.81	7.98	0.441
Desirable Shift	6.00	2.10	6	5.78	2.33	36	0.24	7.23	0.820

* Significant at the $\alpha = 0.05$ level.

The *p*-values for age, years of education, STAR-P scores, STAR-C scores, and ACRS scores are from Welch *t*-tests.

The p-value for gender is from a Fisher's exact test.

Table S3. Comparing the behavioral group participants in our final sample to behavioral group participants we removed from the data set.

	In the final sample			Not in the final sample					
	Mean	*SD*	*n*	Mean	SD	*n*	*t*	*df*	*p*
Age	39.26	11.60	91	36.80	12.36	177	1.61	192.20	0.108
Years of Education	13.26	3.58	89	13.44	3.49	169	-0.40	175.25	0.690
Male			67			132			0.883
Female			24			45			
Total			91			177			
STAR-P									
Positive Collaboration	20.01	3.40	91	19.91	3.50	128	0.21	197.37	0.838
Clinician Input	10.15	1.67	91	10.04	1.93	130	0.47	209.37	0.637
Non-Supportive Clinician Input	9.33	2.37	91	9.16	2.38	129	0.54	194.74	0.592
STAR-C									
Positive Collaboration	17.99	3.17	91	18.42	3.18	130	-1	194.37	0.318
Clinician Input	9.78	1.53	91	10.13	1.74	130	-1.58	207.92	0.116
Emotional Difficulties	9.49	1.39	91	9.67	1.71	129	-0.82	213.3	0.412
ACRS Score									
Craving	6.01	2.31	91	6.44	2.13	131	-1.41	183.15	0.159
Loss of Control	5.79	2.67	91	6.40	2.36	130	-1.75	178.30	0.082
Continued Engagement	5.37	2.86	91	5.98	2.62	131	-1.62	182.58	0.107
Desirable Shift	5.42	2.55	91	5.76	2.54	130	-0.99	193.21	0.324

* Significant at the $\alpha = 0.05$ level.

The *p*-values for age, years of education, STAR-P scores, STAR-C scores, and ACRS scores are from Welch *t*-tests.

The *p*-value for gender is from a Fisher's exact test.