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Mechanisms of Change in an Organizational Culture and Climate Intervention for Increasing Clinicians' Evidence-Based Practice Adoption in Mental Health

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Mechanisms of Change in an Organizational Culture and Climate Intervention for Increasing Clinicians' Evidence-Based Practice Adoption in Mental Health

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Abstract

Objective: Increasing the adoption of evidence-based practices (EBPs) is a focus of national and international efforts to improve the quality and outcomes of mental health services for youth; however, few studies have examined the multilevel change mechanisms that explain how successful implementation strategies increase EBP adoption. Identifying these mechanisms is necessary to develop more effective and efficient strategies. This study tested the multilevel mechanisms that link an empirically supported organizational implementation strategy called ARC (for Availability, Responsiveness, and Continuity) to increased EBP adoption.

Method: In a randomized controlled trial, 14 outpatient children's mental health clinics in a large Midwestern city were randomly assigned to a three-year ARC implementation strategy (k = 7) or control (k = 7). Measures completed by clinicians (n = 475) at baseline, mid-intervention, post-intervention, and 12-month follow-up assessed organizational culture, organizational climate, clinicians' intentions to adopt EBPs, job-related barriers to EBP adoption, and clinicians' EBP adoption.

Results: Clinicians in the ARC condition reported higher proficiency culture at mid-intervention, higher intentions to adopt EBPs at post-intervention, and fewer policy and procedure EBP barriers, higher odds of adopting a well-established EBP, and greater use of EBPs with clients at 12-month follow-up. Improvement in organizational proficiency culture mediated ARC's effects on clinicians' EBP intentions and together both variables serially mediated ARC's effects on EBP adoption and use of EBPs with clients. Improvement in proficiency culture also mediated ARC's effects on time and workflow barriers but not policy and procedure barriers to EBP adoption. Mediation and moderation analyses of EBP barriers suggested their most important role was to attenuate clinicians' follow-through on positive EBP intentions.

Conclusions: Increasing EBP adoption in children's mental health service systems requires attention to organizational culture as well as job-related policies and procedures. ARC increased clinicians' EBP adoption by creating proficient organizational cultures that activated clinicians' EBP intentions and by reducing policy and procedure barriers to intention enactment. Organizational proficiency culture and organizational policies represent viable targets for increasing EBP adoption in children's service systems.

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Chapter 1

Introduction

A significant barrier to effective children's mental healthcare in the United States is the low rate of adoption of evidence-based practices (EBPs) in children's service systems. During the last five decades, hundreds of controlled clinical trials produced dozens of efficacious prevention interventions and clinical treatments (i.e., EBPs) that address the most common emotional and behavioral disorders of youth (Chorpita et al., 2011; Nation et al., 2003; Weisz & Gray, 2008; Weisz, Jensen-Doss, & Hawley, 2006). Yet numerous studies document the failure of children's service systems to adopt EBPs (Ennett et al., 2003; Evans, Koch, Brady, Meszaros, & Sadler, 2013; Garland et al., 2010; Jensen-Doss & Hawley, 2010; McHugh & Barlow, 2012; Zima et al., 2005); by some estimates, as many as 90% of the mental health services delivered to children and families are not evidence-based (Schoenwald, Chapman, Sheidow, & Carter, 2009). Low rates of EBP adoption are frequently cited as contributing to poor mental health service outcomes for children in the United States and abroad (Collins et al., 2011; Garland et al., 2013; Weisz, Donenberg, Han, & Kauneckis, 1995). In response, the National Institute of Mental Health (NIMH) and the Institute of Medicine have identified the adoption of EBPs as a priority for improving the nation's mental health services (Insel, 2009; Institute of Medicine, 2001; National Institute of Mental Health, 2008) and numerous NIMH-funded studies have focused on developing and testing implementation strategies designed to increase EBP adoption in children's service systems (Landsverk et al., 2011; Tinkle et al., 2013).

Recent reviews indicate the implementation strategies tested to date have only modest effects on clinicians' EBP adoption (Barwick et al., 2012; Beidas & Kendall, 2010; Novins, Green, Legha, & Aarons, 2013; Powell, Proctor, & Glass, 2014). Moreover, efforts to improve

these strategies are hindered by a lack of attention to the change mechanisms that explain how and why strategies influence clinicians' practice-related behaviors (Grol et al., 2007; Parmelli et al., 2011). Understanding these mechanisms is necessary to increase the efficiency and effectiveness of implementation strategies and to identify strategies that are most likely to be successful for specific settings, populations, and EBPs. Although comparative experiments provide important information for selecting from among the strategies that are available today, a better understanding of the multilevel change mechanisms that explain the effects of these strategies offers the best opportunity for developing more effective and efficient strategies in the future (Berwick, 2008; Chen, 1990; Williams & Glisson, 2014b).

The purpose of the present study is to identify the multilevel change mechanisms that link an empirically-supported organizational implementation strategy to increased EBP adoption in children's mental health systems. Organizational interventions are among the most promising implementation strategies tested in children's service systems (Novins et al., 2013) and are based on well-articulated change mechanisms believed to explain their effects on clinicians' EBP adoption (Aarons, Farahnak, & Ehrhart, 2014; Glisson & Schoenwald, 2005; Huis et al., 2013; Larson, Early, Cloonan, Sugrue, & Parides, 2000; Taxman, Henderson, Young, & Farrell, 2014). However, almost no studies have tested these mechanisms and as a result significant questions remain about whether the proposed mechanisms actually account for the effects of the strategies (Parmelli et al., 2011; Scott, Mannion, Marshall, & Davies, 2003; Zohar & Polachek, 2014). These knowledge gaps restrict efforts to improve the efficiency and effectiveness of organizational implementation strategies and prevent organizations from applying the strategies (or their components) in a targeted way (Williams & Glisson, 2014b).

The present study uses data from a four-year randomized controlled trial (RCT) of the Availability, Responsiveness, and Continuity (ARC) organizational implementation strategy (Glisson et al., 2010) to test the mediating role of organizational culture and climate, clinicians' goal-directed motivational processes (i.e., intentions), and job-related EBP barriers as mechanisms for increasing EBP adoption (Williams & Glisson, 2014b). Although multiple RCTs support ARC's positive effects on organizational social context, EBP implementation, and service outcomes in children's service systems (Glisson, Dukes, & Green, 2006; Glisson, Hemmelgarn et al., 2012; Glisson, Hemmelgarn, Green, & Williams, 2013; Glisson et al., 2010), no studies have tested the multilevel linking mechanisms that explain how ARC influences clinicians' practice-related behaviors. Moreover, although convergent theories of innovation diffusion (Rogers, 2003), organizational behavior (Barney, 1986; Cameron & Quinn, 2011; Latham & Pinder, 2005; Schein, 2004; Trice & Beyer, 1993; Zohar & Hofmann, 2012), behavioral science (Fishbein et al., 2001; Godin, Belanger-Gravel, Eccles, & Grimshaw, 2008; Michie et al., 2011; Webb & Sheeran, 2006), and implementation science (Aarons, Hurlburt, & Horwitz, 2011; Greenhalgh et al., 2004; Tabak, Khoong, Chambers, & Brownson, 2012) argue that social and motivational processes form the primary basis for individual's innovation adoption, few implementation strategies purposefully target these antecedents (Beidas & Kendall, 2010; Herschell, Kolko, Baumann, & Davis, 2010; Powell, Proctor, & Glass, 2014) and no experimental studies have tested the roles of these mechanisms in explaining clinicians' increased EBP adoption in mental health settings (Grol et al., 2007; Parmelli et al., 2011).

This study addresses these knowledge gaps by testing a longitudinal, cross-level model that experimentally manipulates organizational culture and climate, clinicians' EBP intentions, and job-related EBP barriers in an effort to increase EBP adoption. Results from the study

provide evidence that organizational social context can be purposefully leveraged to increase clinicians' EBP adoption and shed new light on how proficiency cultures focused on client well-being and clinical excellence activate and facilitate clinicians' EBP adoption. Discussion focuses on the implications of these findings for theory, research, and practice related to increasing successful innovation adoption in children's mental health service systems.

Chapter 2

Literature Review

The Role of Organizational Implementation Strategies in Evidence-Based Practice Adoption

The multilevel change mechanisms that explain how organizational implementation strategies influence clinicians' EBP adoption are suggested by the theoretical models that provide the conceptual basis for ARC. At its core, ARC relies on sociotechnical systems theory (Pasmore, Francis, Haldeman, & Shani, 1982; Trist, 1981) and organizational culture and climate theory (Hofstede, Neuijen, Ohayv, & Sanders, 1990; Glisson & James, 2002; James et al., 2008; Ouchi & Wilkins, 1985; Zohar & Hofmann, 2012) to posit that the effectiveness of mental health services is a function of the fit between an organization's social context and the objectives and characteristics of its core technology (Glisson, 2002). ARC defines organizational social context in terms of the shared behavioral norms and expectations that characterize organizational culture (Cameron & Quinn, 2011; Cooke & Rousseau, 1988) and employees' shared perceptions of the significance of the work environment for their personal well-being that characterize organizational climate (James & Jones, 1974; James et al., 2008). The ARC model argues that mental health agencies often engender cultures and climates that are misaligned with the requirements of effective mental health services, including the imperative to adopt EBPs (Glisson & Schoenwald, 2005). Misalignment occurs because of numerous external and internal pressures that push clinicians' away from role expectations that support clinical effectiveness and toward negative valuations of the work environment for their own and their clients' well-being (Burke, Borucki, & Hurley, 1992; Glisson, 2008; Schorr, 1997). ARC seeks to realign organizational social contexts with service effectiveness by creating proficient cultures that

prioritize client well-being, expect continuous learning, and support and reward clinical competence, and by developing engaged climates that sustain the psychological conditions necessary for clinicians to remain personally involved in their work and experiment with and master new, more effective practice behaviors (Glisson, 2002).

Definitions of EBP in children's mental health services focus on the delivery of psychotherapy protocols and other psychosocial interventions that have been rigorously tested and supported by the results of randomized controlled trials (Weisz & Gray, 2008). Evidence-based practice *adoption* is a clinician's decision to use an EBP with a particular client as the best course of action (Aarons et al., 2011). The ARC model construes EBP adoption as an important component of effective mental health services and integrates Rogers' (2003) diffusion of innovations theory with the sociotechnical model (Rousseau, 1977) and theories of organizational culture and climate (Hofstede et al., 1990; James et al., 2008) to argue that social context is a powerful determinant of this role-related work behavior (Glisson & Schoenwald, 2005). Both diffusion of innovations theory and organizational culture and climate theory argue that cultural norms, shared behavioral expectations, and social processes within a defined social system (e.g., an organization) influence and homogenize individuals' EBP adoption decisions within that system (Glisson, 2002). Diffusion of innovations theory construes cultural norms and social interactions as the primary drivers of a multi-stage social influence process that determines which innovations individuals are exposed to and shapes their attitudes and expectancies regarding those innovations (Rogers, 2003). Organizational culture and climate theories describe how the shared norms and behavioral expectations associated with organizational culture shape individuals' expectancies regarding the reward value of role-related behaviors such as EBP adoption while organizational climate provides the conditions of psychological safety and

engagement necessary for clinicians to feel motivated and efficacious in their attempts to learn and master new EBP behaviors (Brown & Leigh, 1996; Edmondson, 2003; Kopelman, Brief, & Guzzo, 1990). Although these theories emphasize different antecedents, both imply that clinicians' EBP adoption is more heavily influenced by the social norms and processes within an organization's social context than by the technological superiority of one treatment model relative to another or the unique fit of a treatment's characteristics with the needs of a particular client or client population (Hemmelgarn, Glisson, & James, 2006; Williams, & Glisson, 2014b). Following this line of reasoning, a significant lever for increasing clinicians' EBP adoption is manipulation of the shared norms, behavioral expectations, and perceptions of psychological impact associated with learning and EBP adoption within children's service settings (Aarons, Farahnak, & Ehrhart, 2014; Glisson & Schoenwald, 2005).

Numerous empirical studies support the idea that clinicians' selection of treatment models (i.e., EBPs vs. non-EBPs) is more closely related to features of an organization's social context than the unique needs of specific clients or the technological superiority of one treatment model over another (Aarons, Sommerfeld, & Walrath-Greene, 2009; Baer et al., 2009; Glisson & Green, 2006; Glisson & James, 2002; Henggeler et al., 2008; Jensen-Doss, Hawley, Lopez, & Osterberg, 2009; Kramer & Burns, 2008; Nelson & Steele, 2007; Torrey, Bond, McHugo, & Swain, 2012). These studies are consistent with a large body of correlational research in the organizational psychology literature that confirms the association between organizational culture and climate and individuals' work-related attitudes and behaviors, including innovation adoption (Carr, Schmidt, Ford, & DeShon, 2003; Hartnell, Ou, & Kinicki, 2011; Kuenzi & Schminke, 2009; Sackmann, 2011). Organizational implementation strategies such as ARC draw on this

research to argue that changes in organizational culture and climate can be leveraged to increase EBP adoption in children's service systems (Glisson & Schoenwald, 2005).

Conceptualizing Organizational Culture and Climate in Children's Mental Health Services

The constructs of organizational culture and climate have a contested history in which numerous researchers and theorists have proposed models for conceptualizing these constructs and understanding how they relate to individual behavior in organizations and organizational outcomes (Denison, 1996; Schein, 2004; Schneider, Ehrhart, & Macey, 2013; Scott, Mannion, Davies, & Marshall, 2003; Verbeke, Volgering, & Hessels, 1998). This study draws on a conceptual model developed specifically to understand the cultures and climates of children's mental health and social service systems (Glisson, Green, & Williams, 2012; Glisson, Landsverk, et al., 2008; Williams & Glisson, 2014a). The model defines organizational culture as the shared norms and behavioral expectations within a work environment (Cooke & Rousseau, 1988; Hofstede et al., 1990) and organizational climate as employees' shared appraisals of the significance of the work environment for their personal well-being (Glisson, Landsverk et al., 2008; James & Jones, 1974; James et al., 2008). The nomological validity of this model is supported by two national studies of 100 children's mental health clinics and 88 child welfare agencies, respectively, as well as by several multi-organization and multi-unit experimental studies of children's service systems (see Glisson & Williams, 2015 for a review).

The model construes organizational culture as a multifaceted construct that influences and homogenizes clinicians' behavior in three domains pertinent to the outcomes of children's service systems—proficiency, rigidity, and resistance (Glisson, Landsverk et al., 2008). Of these three domains, proficiency is the most salient for influencing clinicians' EBP adoption. Proficient organizational cultures prioritize client well-being and responsiveness to client needs,

expect clinicians to have up-to-date knowledge regarding effective treatment practices, and support and reward clinical competence (Williams & Glisson, 2013). Proficiency norms and expectations increase the likelihood that clinicians will adopt EBPs by eliciting leadership and supervisor behaviors that support EBP adoption and by defining the use of EBPs as an implicit and normative feature of the clinician role (Aarons et al., 2014). Clinicians working in proficient organizational cultures believe their agency prioritizes clinical competence and responsiveness to client needs above competing task demands or job facets (e.g., paperwork, maximization of billable units) and as a result prioritize the use of effective treatment models (i.e., EBPs) as a means of securing desired role-related outcomes (Zohar & Hofmann, 2012) . Shared norms and expectations regarding the use of state-of-the-art practices amongst clinicians in a work unit improves clinicians' attitudes towards EBPs (Aarons et al., 2012), increases their motivation to explore, identify, and adopt new, more effective treatment models (Williams & Glisson, 2014b), and creates mutually reinforcing efficacy-performance spirals (Lindsley, Brass, & Thomas, 1995) in which clinicians' support and encourage one another to adopt EBPs and assist each other in developing EBP competencies (Williams & Glisson, 2013).

Organizational climate is conceptualized as a multifaceted construct consisting of three dimensions related to clinicians' shared valuations of the significance of the work environment for their personal well-being—engagement, functionality, and stress (Glisson, Landsverk et al., 2008; James et al., 2008; James & Jones, 1974). Organizational climates that are perceived as supportive of employees' personal well-being, that is, those that are high on engagement and functionality and low on stress, are believed to activate intrinsic motivational processes associated with increased job involvement, effort, and performance (Brown & Leigh, 1996; Hemmelgarn et al., 2006). Prior research indicates that engagement is the most important of

these dimensions for encouraging EBP adoption (Aarons et al., 2012). Engaged climates are characterized by shared clinician perceptions that they are able to remain personally involved in their work, treat each client in a personalized manner, and accomplish personally meaningful goals in their practice (Glisson, Landsverk et al., 2008). These perceptions are believed to minimize the risk contingencies associated with learning new behaviors, thereby facilitating the experimentation and openness required for adopting EBPs (Edmondson, 1999; Edmondson, 2003). Together, organizational cultures characterized by proficiency and organizational climates characterized by engagement are believed to create the social contexts necessary to support and increase clinicians' EBP adoption (Williams & Glisson, 2014b).

Linking Organizational Culture and Climate to Clinicians' EBP Adoption

Although numerous studies have linked organizational culture and climate to organizational outcomes and individual behavior, much less research has focused on the cross-level mechanisms through which these features of organizational social context influence individuals' work behaviors (Carr et al., 2003; Kuenzi & Schminke, 2009; Sackmann, 2011; Schneider et al., 2013). Cross-level mechanisms describe how higher level organizational properties, such as organizational culture and climate, influence and homogenize lower level organizational properties, such as clinicians' EBP adoption behaviors (Klein, Dansereau, & Hall, 1994; Kozlowski & Klein, 2000). Recent meta-analyses and reviews identify significant gaps in testing the hypothesized cross-level mediators that explain the effects of organizational culture and climate on individuals' role-related work behaviors (Carr et al., 2003; Kuenzi & Schminke, 2009; Sackmann, 2011; Schneider et al., 2013). For example, a meta-analysis by Carr et al. (2003) located no studies that tested the frequently invoked motivational processes believed to

mediate the organizational climate–individual behavior relationship and similar results were reported in Sackmann's (2011) review of the organizational culture literature.

These reviews, and others (e.g., Kuenzi & Schminke, 2009; Schneider et al., 2013), indicate that work attitudes such as job satisfaction and organizational commitment are the most commonly studied cross-level mediators of organizational social context's effects on individual behavior and that each of these constructs have modest mediating effects as hypothesized. However, given the importance of motivational processes to modern theories of work behavior (Latham & Pinder, 2005), as well as their central role in empirically-supported theories of individual behavior and behavior change (Webb & Sheeran, 2006), an important step in understanding how organizational social context influences individuals' behavior such as innovation adoption involves testing the mediating role of motivational processes believed to link organizational culture and climate to individual behavior (Zohar & Hofmann, 2012).

The present study extends previous theorizing on the cross-level mechanisms that link organizational culture and climate to individual behavior (e.g., Carr et al., 2003; Kopelman et al., 1990) by developing and testing a cross-level moderated mediation model that describes organizational social context as both antecedent and facilitator of clinicians' motivation to adopt EBPs. The study draws on well-supported behavioral science theories (Ajzen, 1991; Bandura, 1986; Fishbein & Ajzen, 1975; Fishbein et al., 2001; Triandis, 1980; Michie et al., 2011) and theories of work motivation (Lathan & Pinder, 2005) to argue that the primary individual-level antecedents to clinicians' EBP adoption in children's service systems are motivation—succinctly captured by the construct of *intentions* (Ajzen, 1991)—and environmental constraints—conceptualized as objective or perceived *job-related barriers* that hinder the enactment of clinicians' EBP intentions (Armitage & Conner, 2001; Eccles et al., 2006; Godin et al., 2008;

Perkins et al., 2007; Webb & Sheeran, 2006). According to behavioral science theories, intentions and environmental constraints represent two of the three necessary and sufficient conditions (the third being ability) for behavioral performance (Fishbein et al., 2001; Michie et al., 2011). This assertion is backed by hundreds of empirical studies, including scores of experiments (Webb & Sheeran, 2006), which show that intentions and barriers explain a large amount of variance in individuals' behavior and behavior change (Fishbein, 1995; Jaccard, Litardo, & Wan, 1999). In contrast to implementation theories (and strategies) that stress clinicians' ability (i.e., knowledge and skills) as the primary determinant of EBP adoption (e.g., Herschell et al., 2010), this study draws on behavioral science theory to propose that deficiencies in clinicians' motivation (i.e., intentions) and their experiences of job-related barriers explain a significant proportion of the variability in clinicians' EBP adoption. Moreover, the model tested in this study indicates that organizational culture and climate influence EBP adoption by determining the extent to which clinicians' develop intentions to adopt EBPs and by facilitating or constraining the enactment of clinicians' EBP intentions via job-related barriers.

Intentions represent one's commitment or self-instruction to engage in a target behavior and as such capture the motivational factors that describe how hard one is willing to try or how much effort one will exert in order to achieve a targeted goal (Ajzen, 1991; Webb & Sheeran, 2006). Within the proposed theoretical model, proficient organizational cultures and engaged organizational climates contribute to increased EBP adoption by activating clinicians' intentions to adopt EBPs and by reducing job-related barriers that hinder the enactment of clinicians' EBP intentions. Individuals' develop intentions based on their outcome expectancies, perceptions of social norms, and self-efficacy beliefs with respect to a target behavior (Fishbein et al., 2001). Accordingly, organizational cultures characterized by proficiency norms are expected to increase

clinicians' EBP adoption by optimizing their positive expectancies regarding the reward value of EBP adoption, increasing clinicians' perceptions that EBP use is socially normative, and heightening clinicians' self-efficacy with respect to the adoption of EBPs in clinical practice (Carr et al., 2003; Fishbein, 1995; Kopelman et al., 1990). More engaged climates are expected to increase EBP adoption primarily by influencing clinicians' self-efficacy beliefs. Engaged climates reduce the risk contingencies associated with learning new behaviors and as a result should increase clinicians' self-efficacy with respect to EBP adoption. Increased self-efficacy is an important factor in shaping intentions to engage in a behavior (Jaccard et al., 1999) and studies in children's mental health settings indicate that self-efficacy is an effective predictor of clinicians' EBP adoption (Novins et al., 2013). Together, these processes imply that the influence of proficient organizational culture and engaged organizational climate on clinicians' EBP adoption is mediated by increased and homogenized EBP intentions within the work unit.

Behavioral science theories stress that individuals' enactment of intentions is contingent upon the absence of environmental constraints that prohibit behavioral follow-through and that individuals' experiences of these constraints are unique depending on their personal characteristics and on the characteristics of their situation (Fishbein et al., 2001). Moreover, it is not only *objective* barriers or constraints that inhibit intention enactment, *perceived* environmental constraints can be just as powerful—or more powerful—impediments to individuals' enactment of pre-existing intentions (Webb & Sheeran, 2006). This perspective is consistent with the longstanding emphasis in the organizational research literature on the importance of perceived and actual job characteristics for understanding individuals' work behavior (Hackman & Oldham, 1980). Moreover, it implies that understanding when clinicians

are likely to enact their EBP intentions requires careful assessment of the situation-specific barriers that are most salient to this target population (Michie et al., 2011).

Studies of EBP adoption in mental health settings indicate that job-related barriers are among the most salient and widely cited impediments to clinicians' follow-through on positive EBP attitudes or intentions (Aarons et al., 2009; Bartholomew, Joe, Rowan-Szal, & Simpson, 2007; Gioia & Dziadosz, 2008; Lundgren et al., 2012; McHugh & Barlow, 2010; Raghavan, Inkelas, Franke, & Halfon, 2007). These studies confirm that clinicians working in children's service systems experience different barriers to EBP adoption depending on their specific job in the organization and the specific EBP they are adopting (Amodeo et al., 2011). However, two broad categories of job-related barriers are prominent: those related to time and workflow constraints (e.g., clinicians contend that they do not have enough time to adopt EBPs or that assessment and scheduling practices prohibit EBP adoption) and those related to prohibitive policies and procedures (e.g., agencies fail to provide materials necessary for EBPs, refuse to modify policies to accommodate EBPs, or fail to provide clinical supervision in EBPs). Both types of barriers are frequently cited as impediments to EBP adoption even in cases where EBP use is mandated by state authorities and third-party payers (Jensen-Doss et al., 2009) and when clinicians have ready access to EBP training and consultation (Baer et al., 2009). Given evidence of between-organization variance in these types of barriers and their frequent nomination as salient environmental constraints to clinicians' EBP intentions, the present study tested both types of barriers as potential moderators of the EBP intentions–EBP adoption relationship as well as potential mediators of the effect of proficiency culture on EBP adoption.

Organizational culture theory suggests that the implicit values, priorities, and principles that shape an organization's norms and behavioral expectations also govern the explicit policies

and procedures, workflow arrangements, and time-related expectations embodied in various jobs within an organization (Cooke & Rousseau, 1988; Schein, 2004). As a result, clinicians performing similar jobs in different agencies may be governed by very different sets of policies and procedures, workflow arrangements, and time constraints depending on their organizational cultures (Rousseau, 1977). Building on this logic, this study argues that job-related barriers will serve as a mediator of the effect of organizational proficiency culture on clinicians' EBP adoption. Organizations with more proficient cultures are expected to exhibit fewer job-related barriers to EBP adoption because of their increased propensity to embody policies and procedures that support and encourage EBP adoption, increased willingness to modify workflow arrangements (e.g., intake and assessment procedures) to facilitate EBP adoption, and greater flexibility and time allotted for clinicians to engage in EBP exploration and adoption behaviors due to the higher priority on up-to-date clinical knowledge. These differences in job-related policies and procedures and time and workflow constraints are expected to partially mediate the influence of proficiency culture on clinicians' EBP adoption.

Changing Organizational Culture and Climate with the ARC Implementation Strategy

The ARC organizational implementation strategy is an exemplar of organizational interventions designed to increase EBP adoption by transforming organizational culture and climate and increasing organizational capacity to address job-related service barriers (Glisson, 2008; Glisson & Schoenwald, 2005). ARC is a three-year, team-based process that seeks to improve service effectiveness through three overarching strategies (Glisson et al., 2013). These strategies comprise ARC's action theory (i.e., the hypothesized relationships between the intervention and the mediating variables) and are important for understanding how ARC is

believed to influence organizational culture and climate and reduce job-related barriers to EBP adoption (Chen, 1990).

The first ARC strategy trains front-line supervisors and clinical teams in a set of organizational tools that enable clinicians to identify and remove barriers to service effectiveness (Glisson et al., 2010). These organizational tools do not prescribe *a priori* solutions to job-related service barriers but instead provide the structure and processes necessary for organizations to identify and address their own unique barriers to effectiveness (Glisson, 2008). Organizational tools incorporated into the ARC intervention represent discrete interventions (e.g., goal setting, teamwork, continuous improvement, training analysis and design, feedback systems) that have been tested in business, healthcare, and other industries and are supported by meta-analytic evidence indicating they result in medium to large effect sizes on employee productivity, withdrawal, attitudes, and performance (Guzzo, Jette, & Katzell, 1985; Neuman, Edwards, & Raju, 1989; Robertson, Roberts, & Porras, 1993). Enactment of the organizational tools eliminates job-related barriers to service effectiveness and facilitates the development of social contexts that support and expect continuous learning and improvement.

The second ARC strategy focuses on embedding five principles of service effectiveness (e.g., mission driven, improvement directed, results oriented) into the agency's decision-making processes and sub-systems (Glisson, Hemmelgarn et al., 2012; Osborne, & Gaebler, 1992). All organizations are driven by principles (i.e., fundamental propositions that serve as the basis for belief and action) although those principles are frequently implicit and incongruent with espoused values and priorities (Glisson, 2008). Dynamics within agencies' larger sociopolitical environments—such as restricted revenue streams, frequent policy changes, and negative media attention—often contribute to operating principles within mental health and social service

settings that are counterproductive to effective treatment (Schorr, 1997). ARC displaces unhelpful operating principles by refocusing agency personnel at all levels on five principles that prioritize client well-being (Glisson & Williams, 2015). These principles are designed to activate intrinsic and prosocial motivational processes among clinicians and leadership that result in greater involvement in and support for innovation and change efforts as well as higher levels of service quality and effectiveness (Grant, 2008; Humphrey, Nahrgang, & Morgeson, 2007).

The third ARC strategy focuses on developing leadership and clinician mental models (e.g., openness to change, psychological safety) that are necessary for service innovation and improvement efforts (Glisson & Williams, 2015). Mental models are heuristically-based cognitive representations that form the basis for individuals' reasoning and interpretation of events and stimuli (Hysong, Best, Pugh, & Moore, 2005; Mohammed, Ferzandi, & Hamilton, 2010). Mental models shape leaders' and clinicians' motivation to participate in change efforts by directing attention and guiding inferential processing (Harris, 1994; Mathieu et al., 2000). Studies of innovation adoption in healthcare settings indicate that resistance to (or support for) service improvement efforts are often rooted in the closely held and frequently unarticulated and unrecognized mental models of organizational leaders and members (Hysong et al., 2005). Unless these mental models are identified and aligned with the overarching goal of client well-being, change efforts have little chance of success. ARC encourages an attitude of openness and empirical testing to help move participants' mental models in the direction of innovation and development.

Three RCTs of the ARC intervention in mental health and social service agencies support its effectiveness for reducing caseworker turnover, improving organizational culture and climate, supporting EBP implementation, and improving the outcomes of mental health services for youth

(Glisson et al., 2006; Glisson et al., 2010; Glisson et al., 2013). In the initial RCT of ARC, case management teams randomly assigned to a 12-month ARC intervention experienced 66% lower turnover and significantly improved organizational climate (but not culture) by the conclusion of the intervention period (Glisson et al., 2006). In the second RCT of ARC, youths who received an evidence-based family therapy model in counties randomly assigned to a 36-month ARC intervention experienced superior psychosocial functioning six months after initiating treatment compared to either intervention alone or controls and had significantly fewer out-of-home placements 24 months after initiating treatment (Glisson et al., 2010). Notably, ARC was unrelated to EBP fidelity in this study, suggesting increased fidelity was not the mechanism responsible for ARC's effects on youth outcomes. Finally, in the most recent RCT of ARC, youth mental health programs randomly assigned to participate in a 36-month ARC intervention experienced significantly improved organizational cultures and climates and superior youth outcomes (Glisson, Hemmelgarn et al., 2012; Glisson et al., 2013). This study demonstrated a "dose-response" relationship between improvement in programs' organizational culture and climate profiles and the degree of improvement in youth outcomes; however, ARC's effects on clinician behavior were not examined and no mediation hypotheses were formally tested.

The RCTs described above indicate researchers have made considerable progress in testing ARC's main effects on a range of outcomes related to effective mental health and social services for youth. These studies set the stage for the present investigation which focuses on understanding the cross-level change mechanisms through which ARC influences clinicians' behavior (Williams & Glisson 2014b). Understanding cross-level change mechanisms is critical for increasing EBP adoption in mental health settings because treatment selection decisions are typically clinician-mediated (i.e., individual practitioners select treatment models on a case-by-

case basis). Without an adequate understanding of how organizational implementation strategies influence the individual-level determinants of EBP adoption, investigators will be unable to improve the effectiveness or efficiency of these strategies and practitioners will be unable to apply strategies or their components in a strategic manner based on diagnostic assessments. The present study draws on data from a fourth RCT of the ARC intervention to test the cross-level change mechanisms that explain ARC's effects on clinicians' individual EBP adoption.

Theoretical Model and Hypotheses

Building on ARC's action theory and on the theoretical models outlined above, the present study provides an initial test of the sequential, cross-level change mechanisms believed to mediate and moderate ARC's effects on clinicians' individual EBP adoption (see Figure 1; all Figures and Tables are listed in the appendix). The complete sequence of linkages depicted in Figure 1 is hypothesized to unfold over time and across levels. The model reflects the socially-driven innovation adoption process articulated by diffusion of innovations theory (Rogers, 2003) as well as the cross-level homogenizing influence of organizational social context described by theories of organizational culture and climate (Glisson & Schoenwald, 2005; Williams & Glisson, 2014b; Zohar & Hofmann, 2012). The model is consistent with the sequence of activities enacted during the ARC intervention process (Glisson, 2008) and incorporates the motivational processes and job-specific environmental constraints suggested by behavioral science theories (Fishbein et al., 2001) and theories of organizational behavior (Latham & Pinder, 2005). Furthermore, the links in the model are informed by sociotechnical theory (Trist, 1981) and suggest that organizational implementation strategies such as ARC increase clinicians' EBP adoption by improving both contextual (i.e., organizational culture and climate) and technical (i.e., job-related EBP barriers) capacities of agencies.

Main Effects of ARC on Organizational Culture and Climate. The first set of linkages in Figure 1 rely on ARC's action theory (Glisson, 2008) to hypothesize that participation in the ARC intervention will contribute to more proficient organizational cultures and more engaged organizational climates (see Figure 2 for a timeline of hypothesized changes and measurement of constructs). These effects represent organization-level changes in culture and climate caused by the collective enactment of the three ARC strategies (Glisson et al., 2010). The effects are hypothesized to occur at 24 months post-baseline, following the mid-point of the ARC intervention but prior to its termination. This is consistent with the timing of the phased ARC activities and with previous research showing that ARC improved organizational culture and climate in mental health programs following an 18-month intervention period (Glisson, Hemmelgarn et al., 2012).

Organizational Culture and Climate as Mediators of ARC's Effects on EBP Intentions and Job-Related EBP Barriers. The second set of linkages in the model describes organizational culture and climate as mediators of ARC's effects on clinicians' individual EBP intentions and experiences of job-related EBP barriers. The model proposes that ARC will indirectly influence clinicians' EBP intentions by contributing to more proficient organizational cultures and more engaged organizational climates (Glisson & Schoenwald, 2005). Clinicians working in organizational cultures characterized by proficiency and organizational climates characterized by engagement are expected to have higher EBP intentions because of increased positive outcome expectancies regarding EBP adoption, increased perceptions that EBP adoption is socially normative, and increased self-efficacy with respect to EBP adoption (Jaccard et al., 1999; Kopelman et al., 1990). Increased proficiency culture and engagement climate associated

with participation in the ARC intervention is therefore expected to mediate ARC's effects on clinicians' individual EBP intentions.

ARC is hypothesized to exert both direct and indirect (mediated) effects on clinicians' experiences of job-related EBP barriers. ARC is expected to directly reduce job-related EBP barriers on the basis of its action theory (Glisson, 2008). The ARC intervention includes organizational tools that help clinical teams identify and remove barriers to service effectiveness, including barriers related to EBP adoption. To the extent that agencies' enact these organizational tools, ARC should result in fewer job-related barriers to EBP adoption (relative to control) in the months following the intervention period (Glisson & Schoenwald, 2005). However, clinicians' experiences of job-related EBP barriers are partially a function of the implicit agency priorities and shared behavioral expectations that constitute organizational culture (Cooke & Rousseau, 1988; Kopelman et al., 1990). As agencies in the ARC condition shift to more proficient organizational cultures, clinicians in those agencies should experience higher levels of agency support and resources for troubleshooting EBP adoption barriers as well as greater practical and social support from colleagues in addressing job-related EBP barriers (Williams & Glisson, 2014b). Accordingly, improvement in proficiency culture is expected to partially mediate ARC's effects on job-related EBP barriers.

The timing of ARC's indirect effects on EBP intentions and job-related EBP barriers is informed by behavioral science theory (Fishbein et al., 2001), theories of organizational culture and climate (Cameron & Quinn, 2011; Schein, 2004), and the ARC action theory (Glisson, 2008). Improvements in organizational culture and climate achieved in the ARC agencies prior to the termination of the intervention require time to translate into increases in individual clinicians' intentions to adopt EBPs. The 12-month time lag between the hypothesized change in

organizational culture and climate (Time 2) and the increase in clinicians' EBP intentions (Time 3) allows for clinicians to develop shared meanings regarding the implications of their new cultures and climates for treatment selection decisions and to begin exploring and developing more favorable outcome expectancies and self-efficacy beliefs regarding EBPs as a viable option for improving service effectiveness (Aarons et al., 2014; Klein, Conn, Smith & Sorra, 2001; Zohar & Hofmann, 2012). A 12-month timeframe allows this process to unfold and is consistent with the few longitudinal studies that examined the association of organizational culture and climate with subsequent change in individuals' attitudes and intentions (e.g., Jones, Jimmieson, & Griffiths, 2005; Schneider, White, & Paul, 1998).

ARC's direct and indirect effects on job-related EBP barriers are hypothesized to occur 6 to 12 months after completion of the ARC intervention (i.e., between Time 3 and Time 4). This is based on the expectation that ARC teams will not begin working to eliminate job-related EBP barriers until after they have developed intentions to adopt EBPs as a viable pathway for improving service effectiveness (Glisson, 2008). Given that increased EBP intentions are not expected until the completion of the ARC intervention (Time 3), job-related EBP barriers should not become salient for clinicians until the period following completion of the ARC intervention (between Time 3 and Time 4). Assuming sustainment of the gains in social context and organizational capacities associated with the ARC intervention, agencies in the ARC condition should be more successful in eliminating EBP barriers in the 12 months following the intervention period as compared to control agencies. Similarly, the time lag between improvement in proficiency culture (Time 2) and decreased job-related barriers (Time 4) is based on the time required for changes in organizational culture to translate into material and social support for addressing job-related EBP barriers.

Job-Related EBP Barriers as a Moderator of the EBP Intentions–EBP Adoption Relationship. The final set of linkages in the model describes an interactive relationship in which clinicians' EBP adoption behavior following the ARC intervention (Time 4) is contingent upon their EBP intentions at the conclusion of the intervention (Time 3) as well as their subsequent experience of job-related EBP barriers (between Time 3 and Time 4). The interaction between EBP intentions and job-related EBP barriers is based on the idea that once individuals have formed intentions to engage in a behavior they are highly likely to enact that behavior unless they encounter environmental constraints that impede follow-through (Latham & Pinder, 2005; Webb & Sheeran, 2006). The present study investigated clinicians' experiences of two types of job-related EBP barriers—time and workflow EBP barriers as well as policy and procedure EBP barriers—as potentially salient environmental constraints on their follow-through on EBP intentions. Both types of barriers are frequently cited in the literature as prominent impediments to clinicians' positive EBP attitudes and intentions (McHugh & Barlow, 2012). Consistent with behavioral science theories (Jaccard et al., 1999; Triandis, 1980) and theories of organizational behavior (Latham & Pinder, 2005), the model depicts job-related EBP barriers as attenuating clinicians' follow-through on EBP intentions. This implies that increasing clinicians' motivation (i.e., intentions) is necessary but not sufficient to increase EBP adoption; implementation strategies must also address the practical and technical job-related barriers that stifle clinicians' efforts to change their practice (Trist, 1981).

Serial Moderated Mediation of ARC's Effects on EBP Adoption. Taken together, the complete set of linkages shown in Figure 1 implies that ARC will indirectly increase clinicians' EBP adoption through three serial mediator chains. Furthermore, the model implies that these chains will interact in explaining ARC's effects on EBP adoption. The first chain implies that

ARC increases EBP adoption in a two-step process involving improved proficiency culture and increased EBP intentions (i.e., ARC → proficiency culture → EBP intentions → EBP adoption). Within this process, participation in ARC contributes to increased proficiency culture, increased proficiency culture leads to increased EBP intentions, and increased EBP intentions lead to increased EBP adoption. The second chain indicates that ARC increases EBP adoption in a two-step process involving improved engagement climate and increased EBP intentions (i.e., ARC → engagement climate → EBP intentions → EBP adoption). Within this process, participation in ARC contributes to increased engagement climate, increased engagement climate leads to increased EBP intentions, and increased EBP intentions leads to increased EBP adoption. The third chain implies that ARC increases EBP adoption via a two-step process involving proficiency culture and reduced job-related EBP barriers (i.e., ARC → proficiency culture → job-related EBP barriers → EBP adoption). In this process, ARC improves proficiency culture, improved proficiency culture contributes to reduced job-related EBP barriers, and reduced job-related EBP barriers leads to increased EBP adoption. All three chains rely on the reasoning outlined above and together the chains imply the complete mediation of ARC's effects on EBP adoption through these specific serial indirect effects.

However, because of the interaction between EBP intentions and job-related EBP barriers in Figure 1, the model implies that the three serial mediator chains interact in their effects on EBP adoption. In what is best described as a serial moderated mediation model, or a conditional indirect effects model, Figure 1 indicates that ARC must successfully activate clinicians' EBP intentions *and* reduce job-related EBP barriers in order to increase EBP adoption. To the extent that either of these serial indirect effects is diminished, ARC's effects on EBP adoption will be limited. Given this formulation, the model suggests multiple, interactive pathways through which

organizational implementation strategies such as ARC influence EBP adoption. Overall, ARC is expected to increase EBP adoption by improving organizational culture and climate, increasing clinicians' EBP intentions, and decreasing job-related EBP barriers. If ARC fails on any of these fronts, it is likely that the overall effects of ARC will be attenuated and the intervention will be unsuccessful in increasing clinicians' EBP adoption.

The present study provides the first test of these four multilevel mechanisms as shown in Figure 1. The study assesses the extent to which these mechanisms explain the experimental effects of an empirically-supported organizational implementation strategy, ARC, on clinicians' individual EBP adoption. Using an experimental design and temporally-sequenced measures over a four year period, the study tests four hypotheses regarding ARC's change mechanisms:

1) The effect of the ARC implementation strategy on clinicians' EBP intentions will be mediated by improvement in organizational culture and climate,
2) The effect of the ARC implementation strategy on job-related EBP barriers will be partially mediated by improvement in organizational culture,
3) EBP intentions will be positively associated with EBP adoption when job-related EBP barriers are low and unrelated to EBP adoption when EBP barriers are high,
4) The covariance structure of the observed variables will match the covariance structure implied by the model hypothesized in Figure 1.

Chapter 3

Method

Subjects and Procedure

The study included 14 outpatient mental health agencies for youth that were purposefully selected from a large mid-Western metropolitan area to reflect the structural and workforce characteristics typical of children's mental health providers nationally (e.g., Schoenwald et al., 2008) and to provide adequate statistical power to test the study's hypotheses. Participating agencies were non-profit outpatient mental health clinics that employed 15 or more clinicians in one or more units and primarily or exclusively served youth referred for emotional or behavioral disorders. Agencies comprised distinct organizations (i.e., distinct boards of directors and legal charters), allowing randomization at the organizational level rather than by team, office, or site. Effort was made to avoid organizations characterized as "early adopters" of treatment innovations (Rogers, 2003) by excluding agencies that had implemented strategic initiatives related to EBP adoption in the 12 months prior to recruitment or agencies that were participating in a conflicting research project at the time of recruitment. Similar to national samples (Schoenwald et al., 2008), clinicians working in the agencies delivered a variety of mental health services to youth (e.g., individual psychotherapy, family therapy, skill-training, groups) in a range of settings (e.g., clinic, home, school) with the specific theoretical orientation and approach for each youth determined by individual clinicians (e.g., cognitive behavioral, integrative-eclectic, family systems, behavioral).

Clinicians within each agency were organized into teams or units based on their primary population served (e.g., youths vs. adults) and units that primarily or exclusively served youths were selected for participation in the study. On average, 34 clinicians per agency participated in

the study during the four year study period (SD = 23.88, min = 8, max = 96), representing more than 86% percent of clinicians in the selected units. Participating clinicians exhibited a variety of levels of training and educational backgrounds including terminal degrees at the associate's (3.4%), bachelor's (19.5%), master's (74.7%), and doctorate levels (2.5%). The most common major was social work (40.2%). The majority of clinicians were female (84.0%) and identified as white (82.9%). Average age was 36.42 years (SD = 11.65) and participants had an average of 9.14 (SD = 8.87) years of experience working in mental health settings.

The study was designed as a randomized field experiment in which half of the agencies were randomly assigned to participate in the ARC organizational intervention for 36 months. Agencies in the control condition received no intervention, although clinicians in these agencies were contacted at equal intervals to collect identical information regarding organizational culture and climate, EBP intentions and barriers, and EBP adoption. Agencies were matched on size prior to randomization and one agency from each pair was randomly assigned to the ARC intervention using a coin toss. This process resulted in seven agencies assigned to the experimental group and seven agencies assigned to the control group. Following completion of data collection for the study, CEOs in the control group were offered a 3-day leadership institute in which they received specific feedback on their organizations' culture and climate profiles along with training on the use of ARC principles to improve service effectiveness in their organizations.

The study employed a four year longitudinal design in which participating clinicians completed questionnaires before, during, and immediately after the three-year ARC intervention period as well as at 12-month follow-up (see Figure 2 for the study timeline). Questionnaires were sequenced and timed based on theory-derived expectations regarding the nature and pace of

change in the hypothesized mechanisms as well as in accordance with expectations regarding the outcomes of the ARC intervention activities. Clinicians in the experimental and control groups completed identical questionnaires at baseline (Time 1 or 6-8 weeks prior to the intervention phase), two-thirds of the way through the intervention period (Time 2 or 24-months post-baseline), immediately after completion of the intervention period (Time 3 or 36-months post-baseline), and at 12-month follow-up (Time 4 or 48-months post-baseline). Questionnaires included scales assessing organizational culture and climate (Time 1 and Time 2), adherence to the ARC intervention (Time 3), intentions to adopt EBPs (Time 3), job-related EBP barriers (Time 4), and EBP adoption (Time 4).

Clinicians completed questionnaires in face-to-face meetings scheduled during regular work hours without supervisors present. To ensure confidentiality, research staff administered the questionnaires and collected them immediately from clinicians in sealed envelopes. Clinicians in all agencies were notified at the beginning of the project that participation in the study was voluntary and were able to opt out of participation by avoiding scheduled meetings or by returning unfilled questionnaires with no penalty or knowledge of their participation by supervisors. Overall response rate across four waves of data collection was 89% (min = 85%, max = 93%). Because of turnover and new hires samples sizes varied from year to year, ranging from a high of 207 clinicians at baseline to a low of 191 clinicians at 12-month follow-up (average year-to-year attrition = 49.44%).

ARC Intervention

The ARC organizational intervention was facilitated by two trained ARC specialists during a 36-month period from 2010 to 2013. Specialists had advanced graduate degrees in industrial and organizational psychology or related fields and five or more years of experience

working with human service teams and interpersonal group processes prior to the study. Training for ARC specialists included reading ARC manuals and facilitation guides, didactic training sessions, and weekly consultation and supervision with developers of the ARC intervention for the duration of the intervention period. The procedures used to train the ARC specialists and the ARC manuals used to guide the intervention process were previously validated in three prior randomized controlled trials of the ARC intervention (Glisson et al., 2006; Glisson et al., 2010; Glisson et al., 2013). Specialists facilitated the ARC intervention in the seven agencies assigned to the experimental group using separate ARC manuals for team leaders and team members. These manuals guided completion of the 12 ARC components in three stages following the five ARC principles. Detailed specification of the ARC components, stages, and principles is available in manuals published by the University of Tennessee Children's Mental Health Services Research Center (cmhsrc.utk.edu).

Measures

ARC Fidelity. Intervention fidelity is a multifaceted construct that entails practitioner adherence, practitioner competence, treatment differentiation, dose, and participant responsiveness (Schoenwald et al., 2011). Participant responsiveness is arguably the most stringent and salient facet of fidelity for team-based organizational interventions such as ARC (Klein, Conn, & Sorra, 2001) and was therefore assessed in the present study as a manipulation check. Fidelity to the ARC intervention (hereafter *ARC fidelity*) was assessed with seven items from the ARC principles questionnaire developed by Glisson and colleagues and previously validated in an earlier RCT of ARC (Glisson et al., 2013). Scale items refer to the unit-level enactment of ARC principles and to the completion of planned ARC activities within the previous month. Items were accompanied by a 5-point rating scale ranging from 1 (*never*) to 5

(*always*). Sample items include "Our program makes changes to be more effective in serving clients" and "All service team members participate in decisions to improve services." Alpha reliability of this scale was 0.75.

Organizational Culture and Climate. Organizational proficiency culture was assessed using the 15-item *proficiency* scale from the Organizational Social Context (OSC) measure (Glisson, Green et al., 2012; Glisson, Landsverk et al., 2008). The factor validity of the OSC was confirmed in two national studies of 100 children's mental health clinics and 88 child welfare agencies, respectively, and subsequent studies confirmed its predictive validity for clinician turnover (Glisson, Schoenwald et al., 2008), program sustainability (Glisson, Schoenwald et al., 2008), service quality (Olin et al. 2014), and youth mental health outcomes (Glisson et al., 2013; Glisson & Green, 2011; Williams & Glisson, 2013; Williams & Glisson, 2014a). Items assessing *proficiency culture* refer to shared norms and behavioral expectations that clinicians will place the well-being of each client first and will be competent and have up-to-date knowledge regarding effective treatment. Sample items include "Members of my organizational unit are expected to be responsive to the needs of each client" and "Members of my organizational unit are expected to have up-to-date knowledge." Items were accompanied by a 5-point rating scale ranging from 1 (*never*) to 5 (*always*). Clinicians' responses to the proficiency culture items were aggregated to the agency level based on a referent-shift consensus composition model (Chan, 1998) and evidence of adequate within-agency agreement (see below for details). Aggregate agency-level scores were converted to T-scores with a $\mu = 50$ and $\sigma = 10$ using national norms from the children's mental health sample (Glisson, Landsverk et al., 2008). Alpha reliability for the proficiency culture scale was .89.

Organizational engagement climate was assessed using the 11-item *engagement* scale from the OSC (Glisson, Landsverk et al., 2008). Engagement items refer to clinicians' perceptions that they are able to personally accomplish many worthwhile goals and remain personally involved in their work and sustain concern for their clients. Sample items include "I feel I treat some of the clients I serve as impersonal objects" (reverse coded) and "I have accomplished many worthwhile things in this job." Items were accompanied by a 5-point rating scale ranging from 1 (*never*) to 5 (*always*). Clinicians' responses to the engagement items were aggregated to the agency level based on a direct consensus composition model (Chan, 1998) and evidence of adequate within-agency agreement (see below for details). Aggregate agency-level scores were converted to T-scores with a $\mu = 50$ and $\sigma = 10$ using national norms from the children's mental health sample (Glisson, Landsverk et al., 2008). Alpha reliability for the engagement climate scale was .83.

The aggregation of clinicians' proficiency and engagement responses to the agency level requires validity evidence in the form of significant inter-rater agreement within work units (Chan, 1998; Klein et al., 1994; Rousseau, 1985). Clinicians' within-agency inter-rater agreement for the proficiency and engagement items was assessed using the $r_{wg(j)}$ index proposed by James, Demaree, and Wolf (1993). A cutoff of .7 is recommended to support aggregation to the unit level (Bliese, 2000; LeBreton & Senter, 2008). Examination of the $r_{wg(j)}$ values for all 14 agencies on both scales indicated that no values exceeded a minimum of $r_{wg(j)} = .82$. The average $r_{wg(j)}$ value for the proficiency scale was .97 with a range from .91 to .99. The average $r_{wg(j)}$ value for the engagement scale was .96 with a range from .82 to .99. Given this evidence for adequate within-agency agreement, aggregate agency-level T scores were used to characterize the organizational cultures and climates of participating agencies.

EBP Intentions. Clinicians' *intentions to adopt EBPs* (hereafter *EBP intentions*) were measured using five items developed specifically for this study following well-developed procedures for constructing intention scales based on the theory of planned behavior (Fishbein et al., 2001; Francis et al., 2004). Items referred to clinicians' intentions to adopt EBPs in their work with clients and to behaviors indicative of intentions to adopt EBPs. Following prior research on EBP adoption in children's service systems (Aarons et al., 2009), the instructions contextualized clinicians' responses by defining an "evidence-based practice" as "a specific treatment protocol that has been developed through research and is supported by the results of controlled treatment studies." Sample items include "I intend to use an EBP in each treatment session," "I have searched the literature for appropriate EBPs to use with my clients," and "Out of the next 10 new clients you see, how many would you expect to treat using an EBP?" Items were accompanied by a 7-point scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*) or an 11-point scale ranging from 0 to 10, as appropriate. Alpha reliability of this scale was 0.80.

Job-Related EBP Barriers. Job-related EBP barriers were assessed with ten items rated on a scale from 1 (*strongly disagree*) to 7 (*strongly agree*). Items referred to two types of population-specific job-related EBP barriers reported in the literature on EBP adoption in mental health settings: (a) *time and workflow barriers* and (b) *policy and procedure barriers* (Bartholomew et al., 2007; Gioia & Dziadosz, 2008; Kramer & Burns, 2008; Torrey et al., 2012). Clinicians' indicated the extent to which they experienced both types of barriers within the last six months. Sample items include "My agency does not provide materials—such as workbooks or technology—that are necessary to use EBPs," "My agency would not change paperwork or forms to accommodate the use of an EBP," "Intake and referral procedures at my agency make it difficult to use EBPs," and "Productivity requirements at my agency make it difficult to use

EBPs." Alpha reliabilities of these scales were 0.85 (time and workflow barriers) and 0.76 (policy and procedure barriers), respectively.

EBP Adoption Criteria. Evidence-based practice adoption is the decision by a clinician to use an EBP treatment protocol with a particular client as the best course of action (Aarons et al., 2011). This broad definition includes multiple facets related to the improvement of a system's capacity to deliver EBPs and increase population-level client exposure to EBPs (Glasgow, Vogt, & Boles, 1999; Proctor et al., 2010). From a system capacity perspective it is necessary to increase the number of clinicians who have adopted EBPs and consequently exhibit some level of commitment to delivering these treatment models. From a population health perspective it is necessary to increase the proportion of referred youths who are treated using EBPs. This study used two outcome criteria to assess these distinct facets of EBP adoption.

First, clinicians' *EBP adoption* was measured with a condensed version of the EBP checklist developed by Walrath et al. (2006) and validated in previous research on EBP adoption in children's mental health settings (Aarons et al., 2009). Clinicians completed nine items selected *a priori* because of their applicability to the client populations served by the clinicians in this study, their reflection of the most up-to-date evidence regarding the treatment of emotional and behavioral disorders of youth, and their well-established tenure and unambiguous labeling as EBPs (i.e., name brand EBPs). Items referred to whether or not clinicians had used each EBP with any client in the last six months. Participants' responses to the items were summed and the sums were dichotomized to indicate whether or not clinicians had adopted any of the identified EBPs within the last 6 months (yes/ no).

Second, the *percentage of clients treated using EBPs* was assessed with a single-item broadband measure that asked each clinician "What percentage of your clients do you currently

treat using an EBP (0-100%)?" To contextualize participants' responses and to ensure continuity with the EBP intentions measure, the same definition of evidence-based practice was provided to participants (i.e., "a specific treatment protocol that has been developed through research and is supported by the results of controlled treatment studies") and the response line was labeled "% of my clients." This broadband item was used to match the molarity of the EBP intentions measure (Fishbein et al., 2001; Francis et al., 2004) and to capture clinicians' use of EBPs beyond those specifically identified by the EBP checklist. The point biserial correlation between the percentage of clients treated using EBPs and the dichotomous EBP adoption indicator and was $r = .36$, $p < .001$, providing evidence of convergent validity as well as sufficient divergence to justify treating these as distinct criteria.

Control Variables. To optimize statistical power and to adjust for chance differences in baseline social context between the treatment and control agencies, Time 1 agency-level *OSC profile* scores were included as a covariate in all analyses. OSC profile scores represent a configural approach to characterizing organizational culture and climate (Schulte, Ostroff, Shmulyian, & Kinicki, 2009) that incorporates all six dimensions assessed by the OSC (including proficiency and engagement) and provides an efficient and holistic assessment of the organizational social contexts of children's service organizations (Glisson et al., 2014). The predictive validity of OSC profile scores was confirmed in two separate samples of children's mental health agencies on three separate outcome indicators including work attitudes, auditor-rated service quality, and parent-rated service outcomes for youth (Glisson et al., 2013; Glisson et al., 2014; Olin et al., 2014).

Following procedures described by Glisson, Williams, et al. (2014), confirmatory latent profile analysis (Hunt & Jorgensen, 1999; Vermunt & Magidson, 2002; Wang & Hanges, 2011)

was used to calculate OSC profile scores for each agency in the present sample based on a three-class latent profile solution previously derived from a national sample of 100 children's mental health clinics (Glisson, Landsverk et al., 2008). OSC profile scores were computed for each agency in the present sample based on their probability of membership in the three empirically-derived OSC profile categories from the national sample. Profiles are arranged on a continuum ranging from negative (high rigidity, resistance, and stress; low proficiency, functionality, and engagement) to average (near the national mean on all scales) to positive (high proficiency, functionality and engagement; low rigidity, resistance, and stress). Agencies' probability of membership in each of the three profile categories is combined to form a continuous variable ranging from 1.00 to 3.00 where higher values indicate more positive organizational social contexts and whole numbers represent 100% probability of membership in the specified profile category. In the present study, agencies' OSC profile scores at baseline ranged from 1.00 to 3.00 with a mean of 1.70 (SD = .72).

Clinicians' demographic characteristics were unrelated to any of the mediators or EBP criteria in this study and therefore were not included in the analyses with the exception of clinicians' *years of experience* in mental health settings. Clinicians' years of experience exhibited a small negative relationship with time and workflow EBP barriers (r = -.25, p = .001) and a slight positive relationship with EBP adoption (r = .16, p = .035). Prior research has produced mixed results regarding the possible association of clinicians' years of experience with EBP adoption (Aarons et al., 2012). In the present study, the inclusion of years of experience as a covariate did not change the substantive results of the analyses and as a result the more parsimonious analyses are presented below.

Confirmatory Factor Analyses. A series of confirmatory factor analyses were conducted to evaluate the factor validity of the EBP intentions and two job-related EBP barriers scales that were developed for this study (see Table 1; all Tables are listed in the appendix). These analyses incorporated the Satorra-Bentler goodness-of-fit chi-square test (Satorra & Bentler, 1994) and the Satorra-Bentler scaled chi-square difference test (Bryant & Satorra, 2012; Satorra & Bentler, 2001) to account for the non-independence of observations (i.e., clinicians nested within agencies). Model comparison tests indicated that the hypothesized three factor model (Model 3) fit the data significantly better than a one-factor model (Model 1) in which all items loaded on a single factor ($\Delta\chi^2 = 209.15$, $df = 3$, $p < .001$) and a two-factor model (Model 2) in which intentions items loaded on one factor and all barriers items loaded on a second factor ($\Delta\chi^2 = 83.55$, $df = 2$, $p < .001$). Although goodness-of-fit and deviance statistics suggested the hypothesized three-factor model (Model 3) exhibited adequate fit to the data (root mean square error of approximation [RMSEA] = .05, RMSEA 90% CI [.04 to .07], p RMSEA <= .05 = .368, comparative fit index [CFI] = .93, standardized root mean square residual [SRMR] = .08), examination of the modification indices suggested model fit could be improved by estimating two residual covariance parameters. Examination of the item pairs in question confirmed that each pair loaded on a consonant factor and had similar item content. Consequently, these residual covariances were estimated in Model 4, resulting in significantly improved model fit ($\Delta\chi^2 = 23.81$, $df = 2$, $p < .001$). Model 4 supported the hypothesized factor structure of the EBP intentions and job-related EBP barriers scales and was accepted as the final model (RMSEA = .04, p RMSEA <= .05 = .864; CFI = .96; SRMR = .07). Unstandardized factor loadings for all indicators were statistically significant, $p < .001$ and all standardized factor loadings were $\geq .5$ with a mean of .68.

Data Analytic Strategy

The study hypotheses were tested in four steps. In the first step, improved organizational culture and climate were tested as mediators of ARC's effects on clinicians' EBP intentions and job-related EBP barriers. These simple mediation analyses addressed Hypotheses 1 and 2, respectively. Using notation suggested by Krull and MacKinnon (2001), these were 2-2-1 multilevel mediation models where both the independent variable, X (i.e., ARC), and the mediator variable, M_1 (i.e., Time 2 organizational culture or climate), were measured at level 2 (the agency level), and the criterion variables, Y (i.e., Time 3 EBP intentions and Time 4 job-related EBP barriers), were measured at level 1 (the clinician level).

In the second step, job-related EBP barriers were tested as a moderator of the relationship between EBP intentions and the two EBP adoption criteria. These analyses addressed Hypothesis 3. In these analyses, the variance in the two predictors (i.e., EBP intentions and EBP barriers) was partitioned into between-agency and within-agency components and the interaction was tested at both levels. Partitioning the variance allowed examination of the interaction at both the agency and clinician levels and anticipated subsequent steps of the analysis where variance partitioning was necessary for accurate model specification in cross-level serial mediation models (Raudenbush & Bryk, 2002; Zhang, Zyphur & Preacher, 2009).

In the third step, improvement in organizational culture/ climate (M_1) and improvement in the clinician-level EBP antecedents (M_2) were assessed as serial mediators of ARC's effects on the two EBP adoption criteria. These serial mediation models were of the form 2-2-1-1 because the independent variable (i.e., ARC) and the first mediator (i.e., organizational culture or climate) were at level 2 and the second mediator (i.e., clinicians' EBP intentions or job-related barriers) and the outcome (i.e., EBP adoption) were at level 1. These analyses partially addressed

Hypothesis 4 and provided information for the fourth and final serial moderated mediation model.

In the fourth step, the serial mediation models from Step 3 were integrated with the interaction analysis from Step 2 by testing a conditional indirect effects model, also known as a serial moderated mediation model. In this analysis, job-related EBP barriers (*V*) moderated the serial indirect effect of ARC on the EBP adoption criteria (Y_1 and Y_2) through culture/ climate (M_1) and EBP intentions (M_2). This analysis addressed Hypothesis 4. Together, the four sets of analyses tested the complete set of linkages hypothesized in Figure 1.

Given the hierarchical structure of the data (i.e., clinicians nested within agencies) mixed-effects regression models, also known as hierarchical linear models (Hofmann, Griffin, & Gavin, 2000; Raudenbush & Bryk, 2002) and random coefficient models (Bliese, 2002), were used for data analysis. All mixed effects regression models included random intercepts to account for the nesting of clinicians within agencies using the TWOLEVEL procedure in Mplus software (Mplus Version 7) as described by MacKinnon (2008). Prior to testing the study's hypotheses, tests for potential random slope variance in the level 1 mediators (i.e., EBP intentions, job-related barriers) were conducted using a likelihood ratio chi-square test to compare models with and without the slope variance parameters. These analyses indicated that the relationships between the individual-level EBP antecedents (i.e., intentions and barriers) and EBP adoption criteria did not differ across agencies (all *p*s > .05); consequently, slopes for the level-1 mediators were estimated as fixed.

Tests of Simple Mediation. Hypotheses 1 and 2 test simple mediation models using the product of coefficients method for multilevel mediation described by Krull and MacKinnon (2001) and MacKinnon (2008). These analyses estimated the mediated, or indirect, effect of

ARC (*X*) on EBP intentions (*Y*) and job-related EBP barriers (*Y*) through organizational culture or climate (M_1). As shown in Figure 3 (panel A), simultaneous equations are fit to the data which parse the total effect of *X* on *Y*, denoted *c*, into two components—a direct effect, *c'*, and an indirect effect, *ab*. In 2-2-1 mediation models where both *X* and M_1 are at level 2, the first equation regresses M_1 on *X* in a single-level OLS regression to provide an estimate, *a*, of the effect of the independent variable on the mediator. In the second equation, the level-1 *Y* is regressed on the level-2 M_1 and *X* simultaneously in a multilevel mixed effects regression model with a random intercept. This model estimates the effect, *b*, of the mediator on the criterion, holding the independent variable constant, and the direct effect, *c'*, of the independent variable on the criterion holding the mediator constant. Covariates such as baseline OSC profile are included in all analyses. The product of the *a* and *b* coefficients from these analyses, *ab*, provides an unbiased point estimate of the cross-level indirect or mediated effect of *X* on *Y* through M_1 (Kroll & MacKinnon, 2001; MacKinnon, 2008).

Several procedures are available for developing statistical inference regarding indirect effects in mediation models and simulation research demonstrates that these methods do not perform equally well in terms of Type I error rates, statistical power, or confidence interval coverage (Biesanz, Falk, & Savalei, 2010; Hayes & Scharkow, 2013; MacKinnon et al., 2002; MacKinnon, Lockwood, & Williams, 2004). Based on the results of these studies and on the recommendations of methodologists (e.g., Hayes, 2013; MacKinnon, 2008), this study relied on two complementary approaches to test the indirect effects of ARC. First, a null hypothesis significance testing approach was incorporated based on the joint significance test (Cohen & Cohen, 1983, p. 366). This approach considers the joint null hypothesis, H_0: $a = 0$ and $b = 0$, and rejects H_0 in the event that the null hypotheses for both the *a* and *b* coefficients are rejected in

their respective models. In a comprehensive simulation study comparing 14 methods for testing the statistical significance of indirect effects, MacKinnon et al. (2002) found that the joint significance test provided the best balance of Type I error rates and statistical power. Simulation research also demonstrated that the joint significance test was superior to other methods for testing indirect effects in serial mediation models such as those described below (Taylor, MacKinnon, & Tein, 2008).

The null hypothesis significance testing approach was augmented by incorporating asymmetric 95% confidence limits (CIs) for the mediated (indirect) effect based on computationally intensive Monte Carlo methods (Biesanz, Falk, & Savalei, 2010; Hayes & Scharkow, 2013; MacKinnon, 2008). Monte Carlo methods provide more accurate confidence limits and exhibit higher statistical power (while maintaining Type I error rates) than normal theory approaches to CI estimation because the sampling distributions of indirect effects rarely conform to the normality assumption (MacKinnon et al., 2004). The Monte Carlo method uses parameter estimates of the *a* and *b* effects and their standard errors to construct an empirical sampling distribution of the indirect effect. If the 95% confidence limits of the empirical sampling distribution do not span zero, researchers infer that the population value is non-zero (Preacher & Hayes, 2004). Monte Carlo confidence intervals are ideal for testing indirect effects in multilevel mediation models because of their excellent performance with respect to Type I error rates (Biesanz et al., 2010), the underdevelopment of alternative resampling methods such as bootstrapping for multilevel models (Hayes, 2013), and the flexibility of Monte Carlo simulation for accommodating sampling distributions of serial indirect effects such as those described below (Preacher & Selig, 2012).

Tests of Simple Moderation. Hypothesis 3 stipulates that EBP intentions will be positively related to EBP adoption criteria when job-related barriers are low and unrelated to EBP adoption criteria when job-related barriers are high. This hypothesis incorporates the criteria of interest (i.e., EBP adoption and percentage of clients treated using EBPs) by testing whether the hypothesized level-1 EBP antecedents (i.e., EBP intentions and job-related EBP barriers) interact in predicting clinicians' individual EBP adoption behaviors (Y_1 and Y_2). Because this interaction will be integrated into a two-level mediation model in subsequent steps of the analysis, it was necessary to partition the variance in the two EBP antecedents into two levels (between-group and within-group components) prior to computing and testing the interaction at both levels (Kreft, de Leeuw, & Aiken, 1995; Neuhaus & Kalbfleisch, 1998). In 2-1-1 mediation models, level-1 mediators include both between-group and within-group variance and each component may have different relationships to the criterion (Klein et al., 1994; Kozlowski & Klein, 2000). Because the effects of a level 2 independent variable, *X*, can only be transmitted through the between-group component of a level-1 mediator, it is necessary to partition the variance in the level-1 mediator into level 2 (between-group) and level 1 (within-group) and use both components in estimating the indirect effect in order to avoid obtaining biased estimates of the cross-level indirect effects and unacceptable Type I error rates (MacKinnon, 2008; Zhang, Zyphur, & Preacher, 2009). The coefficient for the between-group component is used as the estimate of *b* in calculating the indirect effect.

Zhang et al., (2009) follow Kreft, de Leeuw, and Aiken (1995) in calling this the *centered within context with means reintroduced approach* (CWC[M]). They present simulation research showing that estimates of the indirect effect in 2-1-1 mediation models derived through the CWC(M) approach are more accurate and have superior Type I error rates than biased estimates

obtained through traditional methods that conflate between-group and within-group variance in a single level-1 *b* slope estimate. The level-1 *b* slope in the traditional approach is biased because it consists of a weighted combination of the within- and between-group effects of the level 1 mediator on the level 1 criterion (Neuhaus & Kalbfleisch, 1998; Raudenbush & Byrk, 2002).

Given the above considerations, the variance in both level-1 EBP antecedents (i.e., EBP intentions and barriers) was partitioned into within-group and between-group components prior to conducting the moderation analyses for hypothesis 3 (Zhang et al., 2009). Agency means were calculated to capture the between-group component of the mediator and clinicians' individual scores were subtracted from the agency means (i.e., group-mean centering) to capture the within-group component (Kreft, de Leeuw, & Aiken, 1995; Neuhaus & Kalbfleisch, 1998; Raudenbush & Byrk, 2002). Separate interaction terms were calculated for the between-group and within-group components of each EBP antecedent and these were entered with the main effects at both levels in the moderation analyses. In total, four mixed effects regression models were estimated to test Hypothesis 3, one for each combination of job-related EBP barrier (i.e., policy/procedure barriers vs. time/workflow barriers) and EBP adoption criteria (i.e., EBP adoption vs. percentage of clients treated using EBPs). All models incorporated a random intercept to account for the nesting of clinicians within agencies and all slope parameters were fixed.

Tests of Serial Mediation. Hypothesis 4 stipulates that the covariance matrix hypothesized in Figure 1 will match the observed covariance matrix of the sample data. Ideally, this hypothesis would be tested using multilevel structural equation modeling (SEM) which has been advocated for mediation analysis in multilevel models (Preacher, Zyphur, & Zhang, 2010). Unfortunately, when the hypothesized model was estimated using the multilevel SEM routine in Mplus version 7, the program returned error messages indicating that there were an inadequate

number of level 2 units ($k = 14$) to obtain accurate standard error estimates for all model parameters. Consequently, a piece-wise model-testing approach was adopted to test the hypothesized relationships in a series of mixed effects regression analyses. Under the piece-wise approach, each of the three serial mediator chains hypothesized in the model were tested separately (see Figure 3, panel B). Next, the interaction between EBP intentions and job-related EBP barriers was incorporated into a final serial moderated mediation model.

Serial mediation models include two mediators, M_1 and M_2, which sequentially transmit the effect of X on Y in a causal chain (i.e., $X \rightarrow M_1 \rightarrow M_2 \rightarrow Y$). The model hypothesized in Figure 1 posits three cross-level serial mediator chains that transmit ARC's (X) effects on the two EBP adoption criteria (Y). These three paths are summarized in Panel B of Figure 3. In the first path, ARC's effects on EBP adoption are transmitted first through improved organizational culture (M_1) and then through increased EBP intentions (M_2). In the second path, ARC's effects on EBP adoption are transmitted first through improved organizational climate (M_1) and then through increased EBP intentions (M_2). In the third path, ARC's effects on EBP adoption are transmitted first through improved organizational culture (M_1) and then through decreased job-related EBP barriers (M_2).

These serial mediator chains were of the form 2-2-1-1. The X and M_1 variables (ARC and organizational culture or climate) were modeled as agency-level (level 2) constructs that influenced clinician-level (level-1) EBP antecedents, M_2 (EBP intentions or job-related EBP barriers), which subsequently influenced clinicians' individual-level EBP adoption behaviors, Y (EBP adoption or percentage of clients treated using EBPs). Based on the logic described above for accurately modeling the cross-level indirect effects of an agency-level X on an individual-level Y through individual level mediators, both of the level-1 EBP antecedents were partitioned

into between-group and within-group components prior to analysis and these components were used in model specification and testing (Zhang et al., 2009).

Using the product of coefficients approach, tests of the serial indirect effect of *X* on *Y* through M_1 and M_2 (i.e., $X \rightarrow M_1 \rightarrow M_2 \rightarrow Y$) proceed by estimating three simultaneous regression equations (Taylor et al., 2008). In the first equation, M_1 is regressed on *X* to estimate the effect of the independent variable (ARC) on the first mediator in the chain (i.e., organizational culture or climate). Following procedures recommended by Krull and MacKinnon (2001) and MacKinnon (2008), this model is estimated as a single-level ordinary least squares regression. In the second equation, the second mediator in the chain, M_2, is regressed on M_1 and *X* simultaneously to obtain an estimate of the effect of M_1 on M_2, controlling for *X*, and an estimate of the effect of *X* on M_2, controlling for M_1. This model is estimated as a cross-level mixed effects regression model with ARC (*X*) and organizational culture or climate (M_1) at level 2 and the level-1 EBP antecedents (M_2) at level 1. In the third step, *Y* is regressed on M_2, M_1, and *X* to obtain an estimate of M_2's effect on *Y*, controlling for M_1 and *X*, and an estimate of the direct effect, *c'*, of *X* on *Y*, controlling for M_1 and M_2. This model is also estimated as a cross-level mixed effects regression model. Because the indirect effect of a level 2 predictor (i.e., ARC) on a level 1 outcome can only be transmitted via the between-group variance in a level 1 mediator (e.g., EBP intentions), the final model predicting *Y* includes both the between-group (i.e., agency means) and within-group (i.e., groupmean centered) components of the level-1 mediators in order to obtain accurate estimates and statistical tests of the cross-level indirect effect of *X* on *Y* (Zhang et al., 2009).

Following the estimation of these three regression models, the total effect of ARC on the EBP adoption criteria is decomposed into a direct effect, *c'*, and a set of three specific indirect

effects, a_1b_1, a_2b_2, and $a_1d_{21}b_2$. The specific indirect effects include all possible paths from X to Y through the mediators M_1 and M_2 (i.e., $X \rightarrow M_1 \rightarrow Y$, $X \rightarrow M_2 \rightarrow Y$, and $X \rightarrow M_1 \rightarrow M_2 \rightarrow Y$). Estimates of the specific indirect effects are obtained as a product of the applicable parameter estimates from the three models. The specific indirect effects of interest in this study are the serial indirect effects, represented by the parameter $a_1d_{21}b_2$. These serial indirect effects link ARC to EBP adoption through both mediators in the chain (i.e., $X \rightarrow M_1 \rightarrow M_2 \rightarrow Y$). Statistical inference for the serial indirect effects is developed in the same manner as described above for simple mediation models using the joint significance test and asymmetric Monte Carlo 95% confidence limits.

All mediation models were estimated using complete case analysis in order to maximize statistical power and use all available information. That is, all individuals who provided data for all of the variables in each analysis were included in that analysis. Restriction of the analytic sample to only those individuals who provided complete information across the entire four-year study period would have unnecessarily restricted the sample size and discarded information from individuals who provided data for the simple mediation models but not for the serial mediation models. Moreover, because of attrition and slightly different response samples over time, the complete case approach used in this study provides a degree of within-study replication to support the robustness of the results. Results of Little's missing completely at random (MCAR) test supported the MCAR assumption for the study variables, $\chi^2 = 24.08$, $df = 27$, $p = .626$, suggesting that missing responses were not systematic and therefore were unlikely to bias the study results.

Tests of Serial Moderated Mediation. The model in Figure 1 indicates that ARC's serial indirect effects on EBP adoption through improved organizational culture or climate and

increased EBP intentions will be moderated by job-related EBP barriers. Because of the temporal sequencing of the variables, this effect is framed as a serial moderated mediation model, also known as a conditional serial indirect effects model (Hayes, 2013; Preacher, Rucker, & Hayes, 2007). In the model, ARC's indirect effects on the EBP adoption criteria (Y) through culture/ climate (M_1) and EBP intentions (M_2) are conditioned on ARC's successful reduction of job-related EBP barriers (V). The model hypothesizes that ARC will indirectly increase clinicians' EBP adoption via improved organizational culture and climate and increased EBP intentions to the extent that it also decreases clinicians' experiences of job-related EBP barriers in the 12 months following the intervention period.

Following MacKinnon (2008) and Preacher, Rucker, and Hayes (2007), this conditional indirect effects model is tested by adding an interaction term to the third equation from the serial multiple mediator analysis described above. In this mixed effects regression model, the level-1 EBP adoption criteria, Y, is regressed on M_1, M_2, V, M_2V, and X, where M_1 = Time 2 organizational culture or climate, M_2 = Time 3 EBP intentions (agency means), V = Time 4 job-related EBP barriers (agency means), and M_2V = the product of Time 3 EBP intentions (agency means) and Time 4 job-related EBP barriers (agency means). The main effects and interaction term for the within components of the level-1 mediators, M_2 and V, are also included in the model in accordance with the procedures outlined above (Zhang et al., 2009). A statistically significant interaction at the agency level indicates that the serial indirect effect of X on Y through M_1 and M_2 is conditioned on V. Notably, evidence of a conditional indirect effect is only provided when the between-agency interaction term, M_2V, is significant and not when the within-agency interaction term is significant. This is because the indirect effect of ARC (an organizational, level 2, between-group variable) can only be transmitted through the between-

group component of the level-1 mediators. A significant M_2V interaction at level 1 suggests that clinicians' relative EBP intentions (relative to their colleagues in the same agency) interact with their relative experience of job-related EBP barriers (relative to their colleagues in the same agency) to predict their EBP adoption. Individuals who have high EBP intentions relative to their colleagues may represent "early adopters" or otherwise more innovative persons who have developed higher intentions than their colleagues to adopt EBPs. These individuals' perceptions of higher job-related EBP barriers (compared to their within-agency peers) would be expected to weaken their follow-through on their EBP intentions, similar to the interaction hypothesized at level 2. In total, four conditional serial indirect effects models were estimated, one for each combination of job-related EBP barriers and EBP adoption criteria.

Chapter 4

Results

Table 2 presents means, standard deviations, and bivariate correlations for the agency- and clinician-level variables measured for the study. The non-significant correlation between ARC and Time 1 OSC profile (r = .03, p = .912) suggests that the randomization procedure was successful in balancing the treatment and control groups at baseline. The pattern of correlations supports the discriminant and convergent validity of the study measures and suggests the indicators are not simply capturing common method error variance. The absolute value of the correlations ranged from .03 to .69 at the agency level and from .13 to .60 at the clinician level and varied in accordance with theoretical expectations. For example, clinicians' EBP intentions were positively related to both EBP adoption criteria and the two types of job-related EBP barriers were positively correlated with each other yet differentially correlated with other variables such as the percentage of clients treated using EBPs (r = -.13 vs. r = -.45).

Manipulation Check

Two manipulation checks were conducted prior to testing the study hypotheses. The first confirmed that agencies within the ARC condition did not differ in their fidelity to the ARC intervention as reported by clinicians' at the conclusion of the intervention period (Time 3). That is, results of a two-level mixed effects regression analysis (unconditional model) indicated that agencies in the ARC condition did not exhibit significant between-agency variance in APQ scores (τ = .016, SE = .02, p = .422). The second analysis confirmed that the ARC and control conditions differed in their fidelity to the ARC intervention at Time 3. Consistent with this expectation, results of a two-level mixed effects regression analysis indicated that clinicians in the ARC condition reported significantly higher fidelity to the ARC principles and procedures

than clinicians in the control agencies, $\gamma = .26$, $p = .007$, $d = .48$, accounting for 63% of the agency-level variance in APQ scores.

ARC Main Effects on Clinician-Level EBP Antecedents and EBP Adoption

Although current approaches to mediation analysis do not require a significant main effect of *X* on *Y* in order to establish mediation (Hayes, 2013; MacKinnon, 2008), a series of mixed-effects regression analyses were used to test the main effects of ARC on each of the clinician-level EBP antecedents and EBP adoption criteria in order to provide context for interpreting subsequent mediation and moderation analyses. These analyses controlled for Time 1 OSC profile and are presented in Table 3. The effect size (*d*) reported in the table is the adjusted difference between the ARC and control groups, represented by the ARC coefficient, divided by the pooled standard deviation of the criterion (with the exception of the analysis for the dichotomous EBP adoption indicator which is an odds ratio).

Two of the three clinician-level EBP antecedents and both EBP adoption criteria were significantly improved in the ARC condition relative to control. At the conclusion of the ARC intervention (Time 3), clinicians in ARC agencies reported significantly higher EBP intentions ($d = .48$) than clinicians in control agencies. Twelve months after the ARC intervention (Time 4), clinicians in ARC agencies experienced significantly fewer job-related policy and procedure EBP barriers ($d = .62$), significantly higher odds of adopting a well-established (name-brand) EBP within the last six months (OR = 3.94), and significantly higher use of EBPs with clients (81% vs. 55%). ARC did not have a significant main effect on time and workflow EBP barriers although the coefficient was in the hypothesized direction.

Hypotheses 1 and 2 – Tests of Simple Mediation

Hypothesis 1 – Proficiency Culture Mediates ARC's Effect on EBP intentions.

Hypothesis 1 indicated that improved proficiency culture and engagement climate at Time 2 (prior to the conclusion of the intervention period) would mediate ARC's effects on clinicians' EBP intentions at Time 3 (at the conclusion of the intervention period). Consistent with this hypothesis, Time 2 proficiency culture was significantly higher in ARC agencies relative to control (B = 6.91, SE = 2.49, p = .020, ΔR^2 = .28), controlling for the organizations' baseline OSC profiles. Moreover, increased proficiency culture at Time 2 predicted higher clinician EBP intentions at Time 3 (γ = .08, SE = .04, p = .045), controlling for baseline OSC profile and ARC (see Table 4 for a summary of these analyses). The product of these effects (ab) quantifies the mediated, or indirect, effect of ARC on EBP intentions through proficiency culture. Results of the joint significance test and the 95% Monte Carlo confidence intervals indicated this indirect effect was positive and statistically significant (ab = .56, 95% CI [.01 to 1.38]). Consequently, improvement in proficiency culture mediated ARC's effects on clinicians' EBP intentions. Moreover, the direct effect of ARC on EBP intentions was not significant (c' = .06, SE = .63, p = .928), indicating that ARC's effects on EBP intentions were fully mediated by improvement in Time 2 proficiency culture.

Hypothesis 1 – Engagement Climate Mediates ARC's Effect on EBP intentions.

Contrary to Hypothesis 1, Time 2 engagement climate did not differ between ARC and control agencies after controlling for baseline OSC profile (B = -4.28, SE = 4.71, p = .383, ΔR^2 = .06). Moreover, engagement climate was not related to clinicians' EBP intentions (γ = .02, SE = .02, p = .449) after controlling for baseline OSC profile and ARC, and therefore could not serve as a mediator of ARC's effects on EBP intentions. The direct effect of ARC on EBP intentions

remained significant in this analysis (γ = .68, *SE* = .27, *p* = .012) suggesting that engagement climate played no role in transmitting ARC's effects on clinicians' EBP intentions. Given these results, subsequent analyses were limited to ARC's mediated effects on the EBP antecedents and EBP adoption criteria through Time 2 proficiency culture.

Hypothesis 2 – Proficiency Culture Mediates ARC's Effect on Policy and Procedure EBP Barriers. Hypothesis 2 posited that improvement in Time 2 proficiency culture would partially mediate ARC's effects on job-related EBP barriers at Time 4 (i.e., 12 months after completion of the ARC intervention). Two types of EBP barriers were assessed: policy and procedure barriers and time and workflow barriers. Table 5 depicts the mediation analysis testing ARC's indirect effects on policy and procedure EBP barriers through proficiency culture. Results indicated that proficiency culture did not predict policy and procedure barriers (γ = -.02, *SE* = .03, *p* = .531) after controlling for baseline OSC and ARC; therefore, improvement in proficiency culture did not mediate ARC's effects on policy and procedure EBP barriers (*ab* = -.13, 95% CI [-.60 to .27]).

Hypothesis 2 – Proficiency Culture Mediates ARC's Effect on Time and Workflow EBP Barriers. Table 6 presents results from the mediation analysis linking ARC to decreased time and workflow barriers through proficiency culture. Results of the joint significance test and the 95% Monte Carlo confidence intervals supported the hypothesized indirect effect of ARC on time and workflow EBP barriers through improved proficiency culture (*ab* = -.81, 95% CI [-1.55 to -.23]). ARC significantly improved proficiency culture at Time 2 and improved proficiency culture predicted decreased time and workflow EBP barriers at Time 4. In the final step of the analysis, the direct effect of ARC on time and workflow EBP barriers was not significant (*c'* = .50, *SE* = .37, *p* = .174), suggesting complete mediation. These results demonstrate that ARC's

effects on time and workflow EBP barriers were mediated by improvement in proficiency culture.

Hypothesis 3 – Tests of Simple Moderation

Hypothesis 3 stated that clinicians' who experienced more job-related EBP barriers in the 12 months following the ARC intervention would be less likely to follow-through on their intentions to adopt EBPs compared to clinicians who experienced fewer job-related barriers. This represents an interaction between Time 3 EBP intentions and Time 4 EBP barriers in predicting the EBP adoption criteria. Because this hypothesized interaction is integrated into a cross-level mediation chain in future steps of the analysis, it was necessary to partition the variance in both predictors into between-agency and within-agency components and to test the interaction at both levels (Zhang et al., 2009). Partitioning of the variance was necessary because level-1 predictors consist of between-agency and within-agency variance and these two components may have different relationships with the outcome criteria. Moreover, since the mediated effect of a level-2 *X* can only be transmitted through the between-agency component of a level-1 mediator, *M*, any potential moderation of that effect must also occur at the between-agency level. Given these considerations, it was the agency level (level 2) interaction between EBP intentions and job-related EBP barriers that was of primary interest in this study. In the simple moderation analysis, the between-agency component of EBP intentions and EBP barriers were represented by the agency means; these were grandmean centered prior to calculating the interactions in order to facilitate interpretation of the results. The within-agency components of EBP intentions and EBP barriers were represented by the group-mean centered values of these variables for each clinician. Results from the four mixed-effects regression analyses testing hypothesis 3 are shown in Table 7.

Hypothesis 3 –Policy and Procedure EBP Barriers Moderate the EBP Intentions–EBP Adoption Relationship. The top panel of Table 7 shows the interactions between EBP intentions and policy and procedure EBP barriers at both the agency- and within-agency levels for each of the EBP adoption criteria. Only one of these interactions was significant. At the agency level, policy and procedure EBP barriers interacted with EBP intentions in predicting clinicians' logged odds of EBP adoption (γ = -1.32, *SE* = .63, p = .036). This interaction is plotted in Figure 3 and is consistent with expectations. Higher EBP intentions predicted higher (logged) odds of clinician EBP adoption when policy and procedure EBP barriers were low; however, this relationship was attenuated as policy and procedure barriers increased.

To probe this interaction further, an online utility was used to calculate the region of significance for the conditional relationship between EBP intentions and clinicians' (logged) odds of EBP adoption (Preacher, Curran & Bauer, 2006). The region of significance provides cutoff values of the moderator (i.e., policy and procedure barriers) beyond which the relationship between the focal predictor (i.e., EBP intentions) and the outcome (i.e., EBP adoption) is no longer statistically significant (Bauer & Curran, 2005). The value at the lower bound of this region was LL = .82, indicating that the positive relationship between EBP intentions and clinicians' (logged) odds of EBP adoption was not statistically significant in agencies with policy and procedure EBP barriers .86 units above the mean. Two agencies (15%) had policy and procedure scores above this value; both agencies were in the control group. Increased EBP intentions would not be expected to contribute to increased EBP adoption in these agencies because of the presence of high job-related EBP barriers. Results from these analyses provided partial support for Hypothesis 3.

Hypothesis 3 –Time and Workflow EBP Barriers Moderate the EBP Intentions–EBP Adoption Relationship. The bottom panel of Table 7 shows the interactions between EBP intentions and time and workflow EBP barriers at the agency level and the within-agency level for each of the EBP adoption criteria. Only one of these interactions was significant. Within agencies, clinicians' experience of time and workflow EBP barriers (relative to their colleagues within the agency) interacted with their EBP intentions (relative to their colleagues) to predict the percentage of clients treated using EBPs. This effect is plotted in the bottom panel of Figure 3 and was consistent with expectations. The positive relationship between EBP intentions and percentage of clients treated using EBPs was weakened in the presence of higher time and workflow EBP barriers. A region of significance analysis for this interaction effect indicated that although clinicians' experience of time and workflow EBP barriers (relative to their colleagues in the same agency) weakened the relationship between clinicians' EBP intentions (relative to their colleagues in the same agency) and the percentage of clients they treated using EBPs, this relationship remained significant and positive across all observed values of time and workflow EBP barriers. This indicates that although higher time and workflow EBP barriers attenuated the EBP intentions-EBP adoption relationship within agencies, there were no observed values at which the positive relationship would be expected to be non-significant.

Hypothesis 4 – Tests of Serial Mediation

Hypothesis 4 – Proficiency Culture and EBP Intentions Serially Mediate ARC's Effects on EBP Adoption. Hypothesis 4 indicated that ARC's effects on the EBP adoption criteria would be serially mediated by improvement in proficiency culture and subsequently increased EBP intentions (i.e., ARC → T2 proficiency → T3 intentions → T4 EBP criteria). Tables 8 and 9 present results from the serial multiple mediator analyses testing this hypothesis

for each of the EBP adoption criteria. Results of the joint significance test and the asymmetric confidence intervals for both criteria supported the hypothesized model (i.e., ARC → T2 proficiency → T3 intentions → T4 EBP criteria). Relative to control, clinicians assigned to the ARC condition reported significantly higher proficiency cultures at Time 2. In turn, higher Time 2 proficiency culture was associated with higher Time 3 clinician intentions to adopt EBPs which in turn contributed to higher Time 4 EBP adoption (OR = 3.06) and higher percentage of clients treated using EBPs (*d* = .49). For both EBP criteria, the specific indirect effects of ARC through Time 2 proficiency culture (i.e., ARC → T2 proficiency → T4 EBP adoption) and Time 3 EBP intentions (i.e., ARC → T3 intentions → T4 EBP adoption) were not significant, suggesting that the serial mediation effect (i.e., ARC → T2 proficiency → T3 intentions → T4 EBP criteria) accounted for all of the effects of ARC on the EBP adoption criteria. Moreover, because the direct effect of ARC was not significant in either model, these results indicate that the serial indirect effect through proficiency culture and EBP intentions fully mediated ARC's effects on the EBP adoption criteria. These analyses supported Hypothesis 4.

Hypothesis 4 – Proficiency Culture and Time and Workflow EBP Barriers Serially Mediate ARC's Effects on EBP Adoption. The second set of serial mediation analyses tested whether improved proficiency culture and decreased time and workflow EBP barriers serially transmitted ARC's effects on the EBP adoption criteria (i.e.., ARC → T2 proficiency → T4 EBP barriers → T4 EBP adoption criteria). Results from these analyses are presented in Tables 10 and 11. Findings from the joint significance test and the asymmetric confidence intervals supported the hypothesized serial indirect effect of ARC on EBP adoption through proficiency culture and time and workflow EBP barriers (ARC → T2 proficiency → T4 EBP barriers → T4 EBP adoption). In this analysis, clinicians in ARC agencies reported significantly higher proficiency

culture which contributed to significantly lower time and workflow EBP barriers which were associated with increased (logged) odds of clinician EBP adoption (OR = 3.74). The direct effect of ARC on clinicians' EBP adoption remained significant in the final step of this analysis (*c'* = 1.40, *SE* = .58, *p* = .015), indicating that ARC exerted additional effects on EBP adoption independent of its serial indirect effect through time and workflow EBP barriers (i.e., partial mediation). The remaining specific indirect effects in this model (i.e., ARC → T2 proficiency → T4 EBP adoption and ARC → T4 EBP barriers → T4 EBP adoption) were not significant on the basis of the asymmetric confidence intervals and the joint significance test and therefore are not interpreted.

Results from the second analysis failed to support ARC's hypothesized serial indirect effect on the percentage of clients treated using EBPs through proficiency culture and time and workflow EBP barriers (see Table 11). Time and workflow barriers did not predict the percentage of clients treated using EBPs (γ = -1.26, *p* = .853) after controlling for proficiency culture, baseline OSC profile, and ARC and the 95% Monte Carlo confidence intervals spanned zero (-10.93 to 13.67). In sum, results from Tables 10 and 11 provide partial support for Hypothesis 4 by indicating that proficiency culture and time and workflow EBP barriers serially mediated ARC's effects on clinicians' (logged) odds of EBP adoption.

Hypothesis 4 – Tests of Serial Moderated Mediation

The final set of analyses tested two conditional indirect effects models (i.e., serial moderated mediation models) for each EBP adoption criterion (i.e., EBP adoption and percentage of clients treated using EBPs). These models tested whether ARC's serial indirect effect on the EBP adoption criteria through Time 2 proficiency culture and Time 3 EBP intentions (i.e., ARC → T2 proficiency → T3 intentions → T4 EBP criteria) were moderated by

either type of job-related EBP barriers. Although policy and procedure EBP barriers did not serially mediate the effects of ARC, it is possible that they moderated ARC's indirect effects; therefore, both types of barriers were tested as potential moderators. The model in Figure 1 indicates that ARC's serial indirect effect through proficiency culture and EBP intentions should be attenuated in the presence of high job-related EBP barriers.

Hypothesis 4 –Policy and Procedure EBP Barriers Moderate ARC's Serial Indirect Effect on EBP Adoption through Proficiency Culture and EBP Intentions. Results from the two mixed-effects regression analyses (one for each EBP adoption criteria) for policy and procedure EBP barriers are shown in Table 12. These analyses indicated that policy and procedure barriers did not interact with EBP intentions to attenuate ARC's serial indirect effect on the percentage of clients treated using EBPs (γ = 4.81, *SE* = 6.98, p = .491); however, the interaction approached significance in the analysis predicting EBP adoption (γ = -1.30, *SE* = .68, p = .056). Plotting of this interaction effect revealed that it was identical in form to the significant interaction observed in the simple moderation analysis (see Panel A of Figure 3). These results provide partial support for the conditional indirect effects model hypothesized in Figure 1.

Hypothesis 4 –Time and Workflow EBP Barriers Moderate ARC's Serial Indirect Effect on EBP Adoption through Proficiency Culture and EBP Intentions. Results from the two mixed-effects regression analyses for time and workflow EBP barriers are shown in Table 12. These analyses indicated that time and workflow barriers did not interact with EBP intentions to attenuate ARC's serial indirect effect on either EBP adoption (γ = .15, *SE* = .22, p = .484) or percentage of clients treated using EBPs (γ = -1.74, *SE* = 6.09, p = .776). These results indicate that the specific indirect effect of ARC on EBP adoption criteria through proficiency culture and

EBP intentions is not conditioned on the presence of time and workflow EBP barriers. These results do not support the conditional indirect effect of ARC hypothesized in Figure 1.

Exploratory Follow-up Analyses

Given that the serial moderated mediation model was not supported, an alternative serial multiple mediator model was examined in which EBP intentions and job-related EBP barriers *simultaneously* explained ARC's effects on EBP adoption through proficiency culture (i.e., ARC → T2 proficiency culture → T3 EBP intentions & T4 job-related EBP barriers → T4 EBP criteria). In this model, EBP intentions and job-related EBP barriers are pitted against each other as simultaneous and competing mediators rather than crossed as interacting mediators. A set of four analyses were run to test this model, pitting EBP intentions against each of type of job-related EBP barrier, respectively, in predicting the two EBP criteria. These analyses assessed the extent to which the individual-level EBP antecedents uniquely explained the indirect effect of ARC on EBP adoption through proficiency culture, controlling for the competing level 1 antecedent. Because the results from all four analyses were substantively identical, Table 13 presents only one of the analyses. Results from all four models indicated that the effects of ARC on both EBP adoption criteria through proficiency culture were significantly mediated by EBP intentions but not by job-related EBP barriers. The only significant specific indirect effect in all four models was the serial indirect effect through Proficiency culture and EBP intentions (i.e., ARC → T2 proficiency culture → T3 EBP intentions → T4 EBP criteria). These analyses suggest that improved proficiency culture and increased EBP intentions (i.e., motivational processes) are the primary mechanism through which ARC contributed to clinicians' increased EBP adoption and use of EBPs with clients.

As a final follow-up analysis, a simple mediation model was tested in which policy and procedure EBP barriers mediated the effects of ARC on the two EBP adoption criteria (i.e., ARC → T4 policy & procedure EBP barriers → T4 EBP criteria). Although improvement in proficiency culture did not mediate ARC's effects on policy and procedure EBP barriers (Hypothesis 1), it was still possible that ARC indirectly improved EBP adoption and clinicians' use of EBPs with clients through decreased policy and procedure EBP barriers. Results from these analyses are shown in Tables 14 and 15. Both analyses supported the hypothesis that reduced policy and procedure EBP barriers mediated ARC's effects on EBP adoption.

Chapter 5

Discussion

Increasing the adoption of EBPs in community practice settings is necessary for improving the outcomes of children's mental health services in the United States and worldwide (Collins et al., 2011; Insel, 2009). Despite a great deal of theory and research on the multilevel correlates of EBP adoption (Aarons et al., 2011; Damschroder et al., 2009; Greenhalgh et al., 2004) and numerous RCTs of implementation strategies (Barwick et al., 2012; Beidas & Kendall, 2010; Novins et al., 2013; Powell et al., 2014), experiments have generated almost no knowledge regarding the generalizable and malleable *change mechanisms* that contribute to increased EBP adoption (Grol et al., 2007; Williams & Glisson, 2014b). The present study addressed this knowledge gap by testing four multilevel change mechanisms within the context of an RCT of ARC, an empirically-supported organizational implementation strategy (Glisson et al., 2010). The four mechanisms—including organizational proficiency culture, organizational engagement climate, clinician EBP intentions, and job-related EBP barriers—enjoy convergent empirical and theoretical support from the organizational, behavioral, and implementation science literatures yet are infrequently targeted by implementation strategies in children's mental health and other service systems (Novins et al., 2013; Powell et al., 2014). Using data collected in 14 children's mental health clinics over a four-year period, this study tested the extent to which these variables mediated and moderated the effects of ARC on clinicians' individual EBP adoption.

One of the study questions addressed the causal influence of organizational culture and climate (i.e., organizational social context) on clinicians' individual EBP adoption. Despite several review articles and meta-analyses documenting significant correlations between features

of organizational social context and individuals' work attitudes and behaviors (e.g., Carr et al., 2003; Colquitt, LePine, & Noe, 2000; Hartnell et al., 2011; James et al., 2008; Kuenzi & Schminke, 2009; Sackmann, 2011), observers have questioned culture and climate as levers for changing clinicians' practice behaviors. These critiques cite the lack of experimental studies demonstrating that improvement in organizational culture and climate precede, rather than follow, improvement in service effectiveness as well as a lack of cross-level theory and research regarding the mechanisms that explain how culture and climate influence individual behavior (Scott, Mannion, Marshall, & Davies, 2003).

Results from the present study clearly support an organizational social context-centered mediation model in which improved proficiency culture contributes to increased clinician intentions to adopt EBPs, decreased job-related EBP barriers, and increased EBP adoption. These findings support theoretical models and organizational implementation strategies that construe organizational culture as a malleable and effective target for leveraging change in clinicians' EBP adoption (Cameron & Quinn, 2011; Glisson et al., 2010; Williams & Glisson, 2014b). Although previous experiments demonstrated that organizational interventions improve organizational culture in mental health agencies (Glisson et al., 2012), this is the first study to demonstrate that the experimental manipulation of organizational culture accounted for the effects of an organizational intervention on clinicians' EBP intentions and EBP adoption. The cultivation of proficiency norms and expectations that emphasize clinical excellence and responsiveness to client needs creates a social context that increases clinicians' intentions to adopt EBPs and enables the enactment of those intentions through the reduction of job-related EBP barriers.

A second domain of mechanisms addressed by this study involved clinicians' individual-level intentions, or goal-directed motivational processes as described by the behavioral science literature and theories of organizational behavior (Jaccard et al., 1999; Latham & Pinder, 2005; Michie et al., 2011; Webb & Sheeran, 2006). Although considerable research suggests that individual intentions influence behavior and behavior change (Armitage & Conner, 2001; Fishbein, 1995; Godin et al., 2008; Webb & Sheeran, 2006), many implementation strategies in health and mental health settings ignore this behavioral antecedent and focus simply on knowledge- and skill-development through training and consultation (Barwick et al., 2012; McHugh & Barlow, 2010; Powell et al., 2014). These strategies risk failure by taking for granted the clinicians' motivation to adopt EBPs. The present study argues that deficits in clinicians' intentions (rather than deficits in knowledge and skill) represent a primary barrier to EBP adoption and shows the extent to which intentions serve as the primary cross-level mediator explaining the influence of organizational social context and ARC on clinicians' EBP adoption.

Results clearly support the pivotal role played by the activation of clinicians' intentions in explaining increased EBP adoption in the ARC agencies. In combination with improved proficiency culture, increased intentions fully mediated ARC's effects on both EBP adoption criteria. Furthermore, in a comparison of the influence of EBP intentions and job-related EBP barriers, intentions, in combination with proficiency culture, fully mediated ARC's relationship with both EBP adoption criteria. Combined with meta-analytic evidence demonstrating the causal role of intentions in individually-focused behavior change interventions (Webb & Sheeran, 2006), results from the present study suggest that clinicians' intentions represent an effective and necessary target for increasing EBP adoption in mental health settings (Casper, 2007).

A third mechanism tested in this study involved the reduction of job-related EBP barriers. Organizational researchers have long conceptualized individuals' work behavior in terms of the influence of specific job characteristics (Hackman & Oldham, 1980) and the notion that job-related barriers might interfere with clinicians' EBP adoption is consistent with behavioral science and organizational behavior theories that identify perceived or actual environmental constraints (i.e., job-related barriers) as moderators of individuals' intentions (Fishbein et al., 2001; Latham & Pinder, 2005; Webb & Sheeran, 2006). From an applied standpoint, the literature on EBP adoption in mental health has frequently highlighted job-related barriers as an impediment to clinicians' EBP adoption (Bartholomew et al., 2007; Gioia & Dziadosz, 2008; Jensen-Doss & Hawley, 2010; Jensen-Doss et al., 2009; McHugh & Barlow, 2012) and implementation strategies designed to identify and eliminate targeted barriers to EBP adoption in healthcare settings (described as *tailored interventions*) have shown promise (Baker et al., 2010). This theoretical and empirical work suggests job-related barriers play a central role in clinicians' EBP adoption, acting as a potential mediator of the relationship between organizational interventions and EBP adoption as well as a moderator of the relationship between EBP intentions and EBP adoption (Jaccard et al., 1999; Latham & Pinder, 2005; Michie et al., 2011; Webb & Sheeran, 2006).

Results from this study provide empirical support for the predictions outlined above. In the simple moderation analyses, both types of barriers—those related to policies and procedures and those related to time and workflow constraints—weakened the positive relationship between EBP intentions and EBP adoption, although at different levels. Policy and procedure EBP barriers interacted with EBP intentions at the agency level such that higher overall agency barriers weakened the association between EBP intentions and adoption. In agencies where

clinicians had developed high levels of EBP intentions but experienced high levels of policy and procedure barriers, clinicians were unlikely to follow-through on their intentions to adopt EBPs. These findings highlight the importance of changes in policies and procedures to support EBP adoption even when the level of clinicians' EBP intentions in the agency is initially high. Consistent with the socio-technical model (Pasmore et al., 1982), this suggests that policies and procedures must be aligned with the strategic objectives of the agency's technical core (i.e., the use of EBPs) to improve organizational performance.

Time and workflow EBP barriers also weakened the positive relationship between EBP intentions and adoption. However, this relationship occurred at the clinician level rather than at the agency level. This reflects a process in which individual clinicians develop high EBP intentions (relative to their colleagues within the same agency) only to have those intentions weakened by time and workflow EBP barriers. Individuals in this situation may be early adopters (Rogers, 2003) or otherwise EBP-inclined individuals who develop high EBP intentions despite the relative apathy regarding EBPs amongst their colleagues. Early adopters begin to explore EBP adoption only to encounter high levels of time and workflow constraints—perhaps because their agency culture does not support EBP adoption. According to behavioral science theories, these time and workflow barriers contribute to abandonment of EBP intentions and adoption. These findings point toward the importance of pulling levers at multiple levels to increase EBP adoption. For some clinicians, motivational factors must be activated in order to increase their adoption of EBPs; for others, motivational factors are already in place and the elimination of time and workflow barriers represents the key factor for increasing EBP adoption.

The finding that ARC influenced policy/ procedure barriers directly and time/ workflow barriers indirectly is consistent with prior research on the relationship between organizational

social context and innovation in organizations showing that both contextual and technical capacities of agencies require attention in order to support EBP adoption (Klein et al., 1994). In a multi-organization field study, Klein et al. (1994) found that organizational social context (specifically normative expectations for use of the innovation) and policies and procedures (including the availability of training, user support, and the quality and accessibility of innovation materials) made independent and significant contributions to employees' use of an innovation. The researchers speculated that these two antecedents to innovation use may operate in different ways. Innovation-supportive policies and procedures—which in the present study includes the provision of clinical supervision and materials to support EBP use—may influence innovation adoption by increasing employees' skill and comfort in innovation use. Normative expectations associated with organizational social context may increase employees' recognition and acceptance of the importance of the innovation and consequently their motivation to adopt it. Findings from the present study replicate the distinct roles played by organizational social context and policies and procedures in supporting innovation adoption and provide support for the hypothesis that organizational social context influences employees' motivation to engage in role-related innovation behavior.

Understanding why ARC influenced time and workflow EBP barriers indirectly (through improvement in proficiency culture) and policy and procedure EBP barriers directly highlights an important difference in the types of barriers clinicians face in adopting EBPs and the types of strategies that may be necessary to address unique types of barriers. One explanation for the differential effect of ARC is that time and workflow barriers reflect a generalized tension between competing task demands in clinical work (e.g., quantity of care versus quality of care, time for documentation versus time for clinical contact) whereas policy and procedure barriers

represent innovation-specific incompatibilities between the resource demands of a particular innovation and an agency's current operating characteristics. Competing task demands are a common feature of work and include examples such as speed versus accuracy and individual accomplishment versus group accomplishment (Zohar & Hofmann, 2012). The (often implicit) priority an agency places on one or the other of two competing task demands is driven by the organization's culture and uncovering which competing task demands are prioritized over others is an important part of an employee's socialization into their work role (Zohar & Polacheck, 2014). In mental health settings, clinicians face competing task demands related to the quantity of billable units versus the quality and individualization of care, a focus on documentation versus face-to-face clinical contact, and other pressures. The extent to which clinicians perceive that they do not have time to adopt EBPs is therefore partially a function of the extent to which they feel pressured by their agency to prioritize competing task demands over the delivery of up-to-date, effective care. A shift toward more proficient organizational cultures that emphasize responsiveness to client needs and up-to-date knowledge and skills would therefore be expected to reduce clinicians' perceptions of time constraints for prioritizing these task demands. Based on this line of reasoning, ARC should indirectly decrease clinicians' experiences of time and workflow-related EBP barriers as ARC improves organizations' proficiency cultures.

In contrast, policy and procedure barriers do not embody an inherent conflict between competing task demands (e.g., quantity versus quality of billable units); instead, these barriers represent the extent to which an agency's policies and procedures engender support for a specific innovation. An agency's policies and procedures may be generally supportive of one innovation—such as an outcome feedback and monitoring system—but not supportive of another innovation—such as an EBP psychotherapy protocol. This difference does not reflect a

difference in cultural norms and expectations (e.g., regarding proficiency or up-to-date knowledge) as much as a difference in the specific types of innovations that map onto the agency's existing policies and procedures. Changes in these policies and procedures therefore would not require a shift in organizational culture; instead, they could be changed directly in response to an analysis of their compatibility with a specific innovation. Changes in policies and procedures represent the operational capacities of agencies and therefore are amenable to direct action by the clinical teams as they use the ARC organizational tools. Clinical teams could use the ARC organizational tools to identify ways in which an agency's policies and procedures do not support a particular innovation (e.g., lack of materials for parent-child interaction therapy) and make changes accordingly. Based on this reasoning, it makes sense that ARC influenced policy and procedure barriers directly (presumably through the organizational tools), rather than indirectly through changes in proficiency culture. This pattern of results implies that improvement in either organizational social context or organizational policies and procedures is insufficient on its own to support EBP adoption. Both types of capacities must be in place to support clinicians in adopting EBPs.

Results from the final serial moderated mediation analysis failed to support the hypothesized interaction between EBP intentions and job-related EBP barriers in explaining ARC's effects on EBP adoption ($p = .056$). However, close inspection of this result suggests it was the success of ARC—not a failure of the theoretical model—that accounts for this outcome. One key to understanding the apparent paradox is the finding that the interaction between intentions and barriers was significant until the effect of ARC was added to the analysis. This indicates that EBP barriers interacted with EBP intentions as hypothesized but not once the influence of ARC was accounted for. In combination with evidence that ARC successfully

increased EBP intentions and decreased job-related EBP barriers, the pattern of results suggests that the success of ARC may have precluded the moderation of its indirect effect through EBP intentions by driving all of the ARC agencies into the same cell with regard to (high) EBP intentions and (low) job-related EBP barriers. Conceptually, the combined success of ARC at increasing EBP intentions and decreasing EBP barriers in the ARC agencies precluded the possibility of an interaction between these two variables; statistically, the restricted range of values observed in the ARC agencies weakened the possibility of a significant interaction. Consequently, despite the non-significant interaction in the final serial moderated mediation model, the pattern of results appears to support an interactive model of intentions and job-related barriers for predicting EBP adoption. Had ARC not been successful in activating both of these mediating mechanisms (i.e., EBP intentions and EBP barriers) in the hypothesized direction, it is likely that the interaction observed in the simple moderation analysis would have held and ARC's indirect effects on EBP adoption through proficiency culture and intentions would have been attenuated by increased job-related EBP barriers.

An alternative explanation for the non-significant interaction between EBP intentions and job-related barriers in the final serial moderated mediation model is low statistical power given the high number of predictors in the mixed effects regression analysis and the relatively small number of level 2 units (14 agencies). However, regardless of whether the non-significant interaction was due to low statistical power or the homogenization of observations in the ARC condition (or both) the overall pattern of results supports the hypothesized model. The ARC intervention increased EBP adoption by increasing proficiency culture which subsequently increased EBP intentions and reduced job-related time and workflow barriers. Studies in which

the components of ARC are manipulated independently would shed further light on the nature of this interaction.

Results from this study support a cascading cross-level model of innovation adoption in children's mental health services that is consistent with Rogers' (2003) diffusion of innovations theory, the sociotechnical model (Pasmore et al., 1982; Trist, 1981), organizational culture theory (Cooke & Rousseau, 1988; Williams & Glisson, 2014b; Zohar & Hofmann, 2012), behavioral science theories (Fishbein et al., 2001; Michie et al., 2011) and theories of organizational behavior (Latham & Pinder, 2005). Within this model, the development of organizational norms and shared behavioral expectations that give precedence to client well-being and prioritize clinical competence elicit increased clinician motivation to adopt EBPs, reduce clinicians' experiences of time and workflow barriers that may impede those intentions, and subsequently increase clinicians' odds of EBP adoption and their use of EBPs with clients. Moreover, removing policy and procedure barriers such as a lack of clinical supervision in EBP models and a lack of necessary materials contributes to increased EBP adoption by creating technical capacities within the agency that support clinicians' enactment of EBP intentions. Figure 5 presents a revised model of ARC's cross-level mechanisms based on the results from this study.

These findings are consistent with and extend meta-analytic evidence that documents correlations between organizational social context, training motivation, and training transfer in the organizational research literature (Colquitt et al., 2000). Studies of training in organizations show that positive organizational social context is associated with increased pre-training motivation and self-efficacy, increased knowledge and skill acquisition from training experiences, and increased post-training transfer of knowledge and skills into the work

environment (Kozlowski, Brown, Weissbein, Cannon-Bowers, & Salas, 2000). To the extent that training is necessary for clinicians to adopt EBPs, findings from the present study suggest that proficient organizational cultures may activate clinicians' intentions to obtain training and consultation in EBPs, increase the value they derive from those training experiences, and ultimately increase the extent to which they employ EBPs with clients in their practice. Further research is necessary to substantiate the links between increased EBP intentions and improved EBP training outcomes; however, the convergence of empirical findings is suggestive. Moreover, results from this study suggest organizational social contexts can be purposefully developed to facilitate EBP adoption processes that incorporate training in specific EBP models.

The hypothesized influence of engaged organizational climate on clinicians' EBP adoption was not supported in this study. This represented a failure of ARC's action theory (i.e., the link between ARC and engagement climate) as well as ARC's conceptual theory (i.e., the link between engagement climate and EBP adoption) (Chen, 1990). ARC failed to improve Time 2 engagement climate and Time 2 engagement climate was not associated with any of the individual EBP antecedents (i.e., intentions, job-related barriers) or EBP adoption criteria after controlling for ARC and baseline OSC or on its own (analyses not shown). An understanding of the breakdown in this hypothesized mediation effect therefore requires an analysis of both the action theory failure and the conceptual theory failure.

The failure of ARC to influence engagement climate by 24 months after baseline (i.e., action theory failure) was not expected in light of previous studies showing that ARC positively influenced engagement in a 12-month and 18-month intervention period (Glisson et al., 2006; Glisson et al., 2012). One possible explanation for this result is that the service barriers targeted and prioritized by clinical teams using ARC in the present study were more closely related to

proficiency norms than engagement climate whereas teams in earlier studies addressed barriers more closely related to clinicians' engagement. Although the ARC principles, tools, and processes are standardized, the ARC intervention is purposefully designed to address the unique service barriers identified by each clinical team (Glisson, 2008). A second possibility is that low statistical power precluded the detection of a significant effect. In earlier studies, ARC's effects on engagement climate were small (i.e., $d = .28$) and therefore the level 2 sample size of $k = 14$ agencies in this study may simply have been too small to detect a significant effect (Glisson et al., 2012).

The non-significant relationship between organizational engagement climate and any of the EBP antecedents or EBP adoption indicators (i.e., conceptual theory failure) questions the causal influence of engaged organizational climate on EBP adoption and helps clarify results from previous studies documenting a significant relationship between engagement climate and clinicians' attitudes toward EBPs (Aarons et al., 2012). In previous research, engagement was represented by two variables—agency-level *organizational* climate (based on evidence of within-unit agreement) and individual-level *psychological* climate (James & Jones, 1974; James et al., 2008). This research indicated that engaged *organizational* climate was not a significant predictor of clinicians' attitudes toward EBPs after controlling for other dimensions of organizational social context whereas engaged *psychological* climate was (Aarons et al., 2012). This suggests that clinicians' individual psychological climate perceptions may be related to EBP adoption whereas agency-level organizational climate may not. Results from the present study produced similar results that support this distinction.

To further investigate the possibility that organizational and psychological climates of engagement had different relationships to the EBP adoption antecedents and criteria, bivariate

correlations were examined at the individual level between these constructs. Clinicians' individual-level engagement (i.e., psychological climate) correlated significantly with EBP intentions (r = .19, p = .011), policy and procedure barriers (r = -.31, p = .001), and EBP adoption (r = .22, p = .027). These significant relationships are consistent with previous studies (Aarons et al., 2012) and, given the replicated non-significant relationship between organization-level engagement climate and EBP antecedents (attitudes and intentions) in both studies, point toward the need for further theoretical development and empirical work regarding the levels at which climate operates in the relationship with EBP antecedents and EBP adoption.

Study Limitations

Strengths of the present study include its experimental design, the time sequenced measurement of mediators based on theoretical expectations over a four year period, and the random assignment of entire organizations (embodying distinct organizational cultures and climates) to experimental and control conditions. Experimental tests of hypothesized cross-level change mechanisms within a longitudinal, multi-organization mediation framework are rare and offer a unique and ideal opportunity to test causal theory. However, findings must be interpreted within the context of the study's limitations. First, the evidence of statistical mediation demonstrated in this study does not confirm that the measured mediators act as causal mechanisms in the EBP adoption process. That is, because the mediators themselves were not experimentally manipulated (although ARC was manipulated), relationships between the mediators and subsequent outcomes cannot be causally interpreted (MacKinnon, 2008). Although some mediators, such as intentions, cannot be directly manipulated, replication studies are necessary to further refine and test the relationships observed here.

Second, the use of therapists' self-reports to assess EBP adoption raises the possibility that EBP estimates are inflated by social desirability biases. Observational and self-report measures of EBP implementation are not always highly correlated (Hurlburt et al., 2010), suggesting clinicians' may inaccurately report EBP adoption or that their execution of EBPs is not always ideal even if they believe they have adopted an EBP. An important issue here pertains to the difference between EBP adoption (i.e., the decision to use an EBP) and EBP implementation (i.e., the level of fidelity to a given EBP protocol) (Aarons et al., 2011). Concerns about poor EBP implementation (i.e., EBP fidelity) are beyond the scope of this study because the goal was to assess mechanisms that influence clinicians' EBP adoption decisions (and the levels of commitment to use specific EBP models) rather than clinicians' subsequent EBP implementation fidelity. In this regard, the low correspondence between self-reported fidelity and observer-rated fidelity are irrelevant to interpreting these study results. Furthermore, clinicians' self-reports of EBP implementation have been linked to youth outcomes in mental health settings (Schoenwald et al., 2009), suggesting that this indicator is an important criterion variable regardless of its relative correspondence with observational measures.

Concerns about the inflation of clinicians' self-reported EBP adoption due to social desirability biases are mitigated by several factors. First, observational research indicates that clinicians reliably report the general contours of their in-session behavior, including the amount of time devoted to treatment targets and foci (Hogue, Dauber, Henderson, & Liddle, 2014). The outcome criteria used here (i.e., percentage of clients treated using an EBP and a yes/no EBP adoption indicator) reflect clinicians' in-session behaviors and, in combination with the wide range of values observed at the individual and organizational levels, may therefore be expected to have acceptable reliability. Second, studies indicate that clinicians self-report suboptimal rates

of EBP adoption even in situations where this behavior is mandated by state authorities as long as they have confidence in the confidentiality of their responses (Jensen-Doss et al., 2009). The present study maximized clinicians' confidence in the confidentiality of their responses by using research assistants unaffiliated with the agencies to collect data and by ensuring that supervisors had no knowledge of clinicians' participation or non-participation in the study. Third, because there is no reason to expect that social desirability biases would interact with treatment condition (i.e., clinicians in the ARC or control agencies are no more or less susceptible to social desirability biases given identical measurement procedures across time) the estimate of ARC's effects on EBP adoption remains unbiased irrespective of the overall inflation (or deflation) in the level of self-reports. Fourth, studies of organizational culture interventions that relied on behavioral observation to assess EBP adoption in healthcare settings demonstrated similar positive effects of these types of interventions on nurses' EBP adoption (Larson et al., 2000). Nevertheless, multi-method measurement of EBP adoption would have strengthened the present investigation and future studies should incorporate more robust and varied measurements of clinicians' EBP adoption behaviors.

A third limitation concerns the extent to which results from this study generalize to other clinicians and organizations. Although effort was made to select clinics for the study that represented the target population, the extent to which findings from these agencies apply to other agencies is unknown. The use of well-validated constructs (e.g., culture, climate, intentions) from converging theoretical perspectives somewhat mitigates concerns about generalization; however, replication of these results in other settings is necessary to support their generalizability across populations of organizations and service professionals. Previous studies of ARC provide some measure of replication regarding ARC's effects on organizational culture and climate

(Glisson et al., 2006; Glisson et al., 2012). However, no other studies have tested the cross-level mediating mechanisms that link ARC and improvement in organizational culture and climate to clinicians' individual EBP adoption. Ongoing experimental studies of ARC in other parts of the United States provide opportunities for replication.

A fourth limitation pertains to the lack of pre-tests for EBP intentions, EBP barriers, and EBP adoption, which precluded assessment of change in these constructs and prevented testing whether clinicians' in ARC and control were statistically equivalent on these constructs at baseline. The post-test only randomized design of this experiment provides unbiased estimates of ARC's effects on the mediator and outcome criteria at their respective endpoints because of the randomization process and the use of mixed effects regression models that account for the clustering of clinicians within agencies (MacKinnon, 2008). However, the lack of pre-tests prevented investigating change in the mediators over time and how pre-post changes in the mediators related to outcomes. Furthermore, the lack of pre-tests may raise concerns that the agencies were not balanced at baseline. These concerns are mitigated by evidence that the treatment and control agencies did not differ on OSC culture and climate profiles at baseline; however, future studies should incorporate pre-tests to better understand how hypothesized mediating mechanisms change during the course of the study and how these changes relate to outcomes. These concerns are also mitigated by the fact that pre-tests can sensitize respondents in experimental designs (via Rosenthal effects and social desirability processes), resulting in post-test responses that produce pre-test by intervention interactions (Shadish, Cook, & Campbell, 2002).

Implications for Theory

Previous research on the theory of reasoned action/ theory of planned behavior (Fishbein & Ajzen, 1975) and other behavioral science theories found weak support for the association between social norms and individuals' intentions and behaviors (Armitage and Connor, 2001). Findings from the present study suggest these weak effects may be due to the single-level conceptualization and research designs that characterize much of the behavioral science literature. Behavioral science theories conceptualize social norms—often referred to as subjective norm—in a way that emphasizes the uniqueness of individuals' perceptions and their desire to conform to those perceptions. By measuring and analyzing social norms as an individual-level construct, these studies conflate within-group and between-group variance in the social norm variable and consequently may inaccurately estimate the construct's relationships to other variables. This is likely because social norms should be most influential when they are shared, that is, when there is widespread within-group consensus on their direction and intensity. Accordingly, social norms should be most effective in explaining between-group variance in individuals' intentions and behaviors and should be only weakly related or unrelated to within-group variance in intentions and behaviors. By using a single correlation that conflates the (potentially strong) between-group relationship between social norm and individual behavior and the (potentially weak) within-group association of social norm and behavior, many studies may provide a downwardly biased estimate of the correlation between social norms and intentions/ behaviors.

Based on this analysis, an important area for theory development and research in the behavioral sciences regards the issue of levels (Klein et al., 1994; Kozlowski & Klein, 2000). The organizational research literature has long emphasized the need to address issues of level in

both theory and research aimed at understanding the influences and expression of individuals' work behavior (Rousseau, 1985); however, a multilevel perspective is relatively underdeveloped in behavioral science theory. Jaccard et al. (1999) offered a small first step in this direction by suggesting that group aggregates of behavioral antecedents such as self-efficacy, self-concept, and attitudes could be construed as contextual influences that determine between-group variance in intentions and behavior. Findings from the present study suggest that this line of research may produce valuable insights into the multilevel antecedents that influence behavior and behavior change.

Implications for Practice

Results from this study have implications for the behavioral antecedents that should be targeted by implementation strategies to increase EBP adoption in children's service settings. Behavioral science theories stress that the salient causes of behavior vary from population to population and an important implication of this assertion is that the salient change mechanisms for increasing EBP adoption may vary between provider populations (Jaccard et al., 1999). A comparison of the results from this study with those from a recent trial designed to increase diabetic retinopathy referrals among primary care physicians (Grimshaw et al., 2014) provides an example of this and suggests that increased intentions and social norms may be especially important to the population of children's mental health service providers. In the retinopathy trial physicians' had high pre-existing intentions and high pre-existing social norms for making referrals prior to the study; consequently, an implementation strategy designed to increase intentions and social norms failed to do either and also failed to increase referrals. A process analysis suggested that a better target for intervention may have been localized barriers that inhibited patients' follow-through on the referrals (Grimshaw et al., 2014). These findings

contrast with the results of the present study in which increased social norms (i.e., organizational culture) and intentions appeared to play a larger role than decreased barriers in explaining clinicians' EBP adoption. Although further studies are needed, findings from the present study suggest prevailing social norms and low levels of motivation play significant roles in the low rates of EBP adoption observed in children's service systems. Accordingly, strategies that fail to address prevailing social norms and increase clinicians' EBP intentions risk failure by ignoring these important behavioral determinants for the target population.

Methodological frameworks for improving the efficiency and effectiveness of implementation strategies indicate that the identification of salient change mechanisms is a first step in the process of strategy refinement (Doss, 2004; Williams & Glisson, 2014b). The present study addressed this need for the ARC intervention by showing that proficiency culture, intentions, and job-related barriers fully explained the effects of ARC on EBP adoption. Next steps include the identification of the change processes, that is, the specific ARC intervention activities that contribute to change in these active change mechanisms. Future research should focus on identifying the ARC strategies (e.g., guiding principles, organizational tools, mental models) that are most important for improving proficiency culture, EBP intentions, and job-related EBP barriers. By linking specific ARC intervention strategies to improvement in these mediators, future studies will inform modifications to ARC and other organizational implementation strategies.

Conclusion

The purposeful transformation of organizational cultures in children's service organizations appears to be an effective mechanism for increasing clinicians' EBP adoption. By creating proficient organizational cultures that prioritize clinical excellence and responsiveness

to client needs, organizational implementation strategies such as ARC increase clinicians' intentions to adopt EBPs and facilitate the enactment of those intentions through the reduction of job-related EBP barriers. The activation of these contextual and motivational levers increases clinicians' EBP adoption and their use of EBPs with clients. Unless implementation strategies create supportive organizational social contexts that activate and facilitate clinicians' EBP intentions, it is highly unlikely that they will contribute to increased EBP adoption. Future research should focus on identifying the specific change processes (i.e., intervention strategies) that most efficiently and effectively contribute to the formation of proficient organizational cultures that support clinicians' ongoing EBP adoption in children's mental health services.

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Appendix

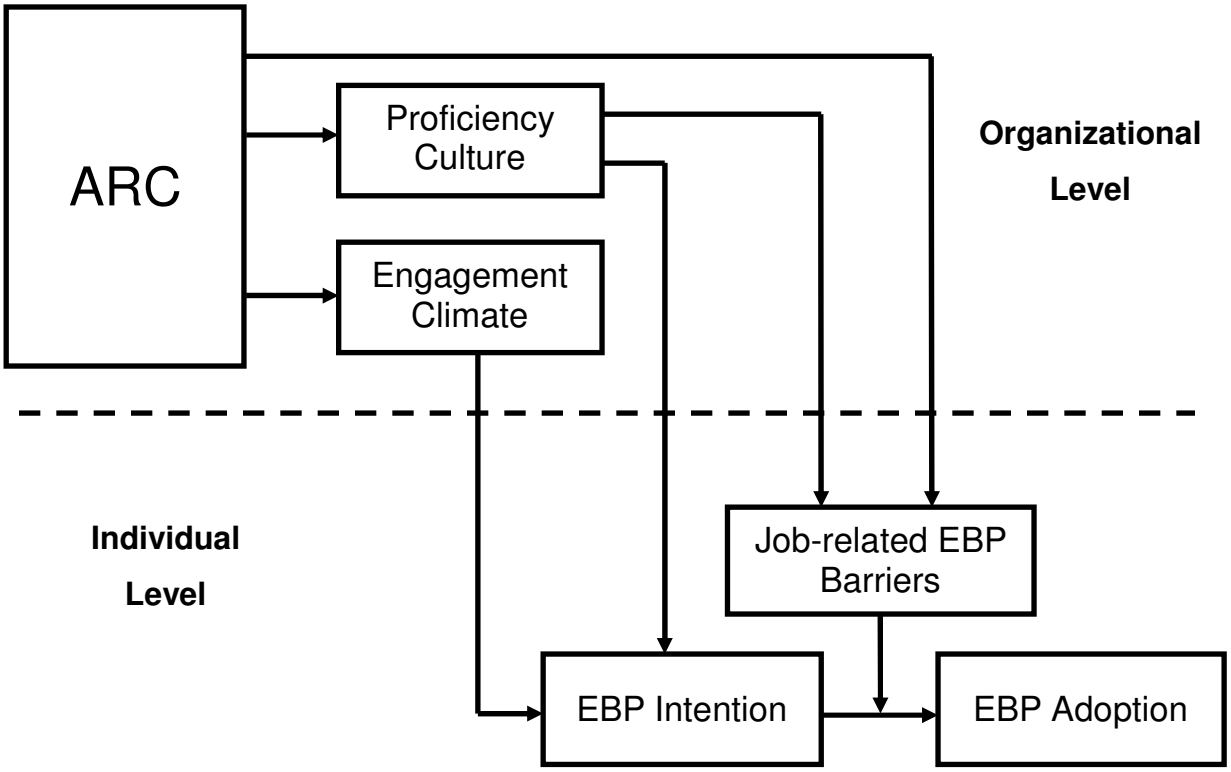


Figure 1. Study Theoretical Model

Note: ARC = availability, responsiveness, and continuity organizational implementation strategy; EBP = evidence-based practice.

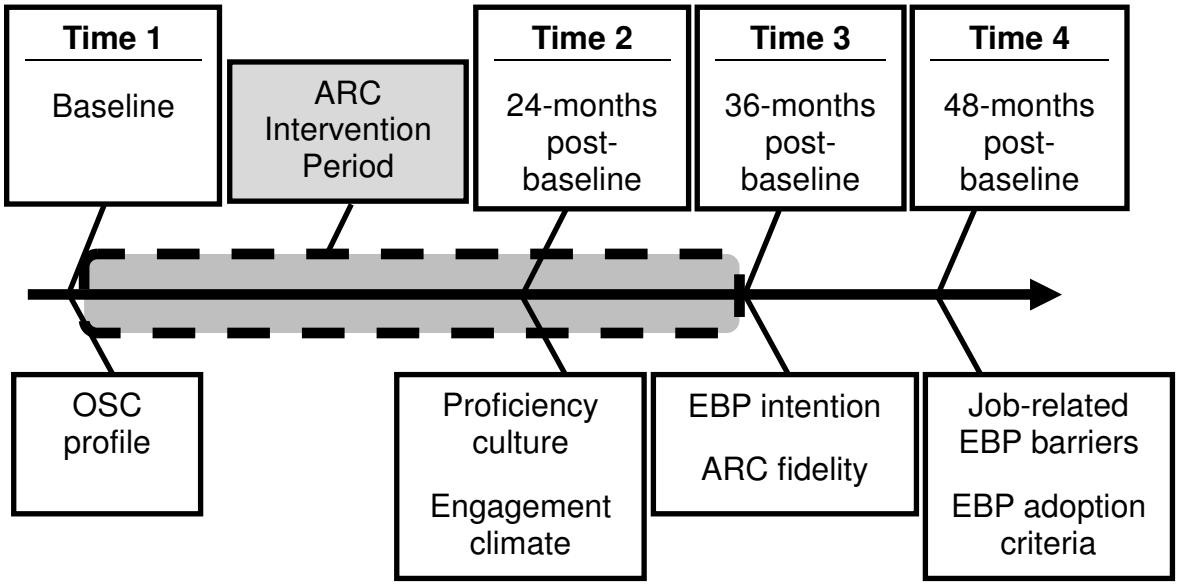
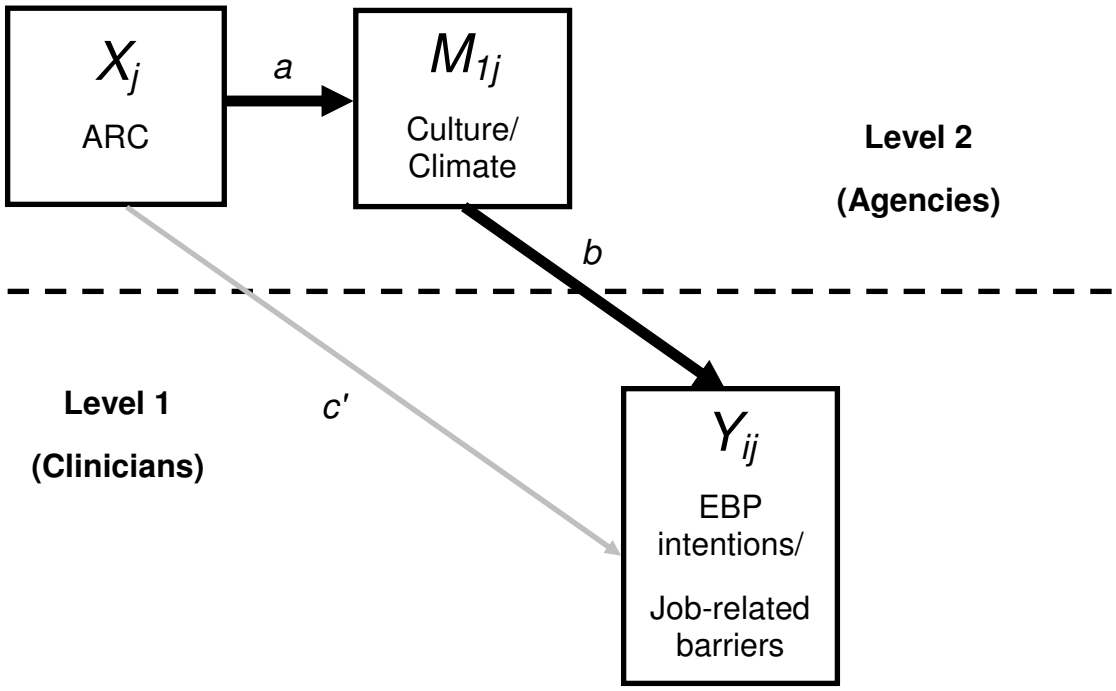


Figure 2. Study Timeline

Note: OSC = organizational social context; ARC = Availability, Responsiveness, and Continuity organizational intervention; EBP = evidence-based practice.

2-2-1 Mediation Model



2-2-1-1 Serial Mediation Model

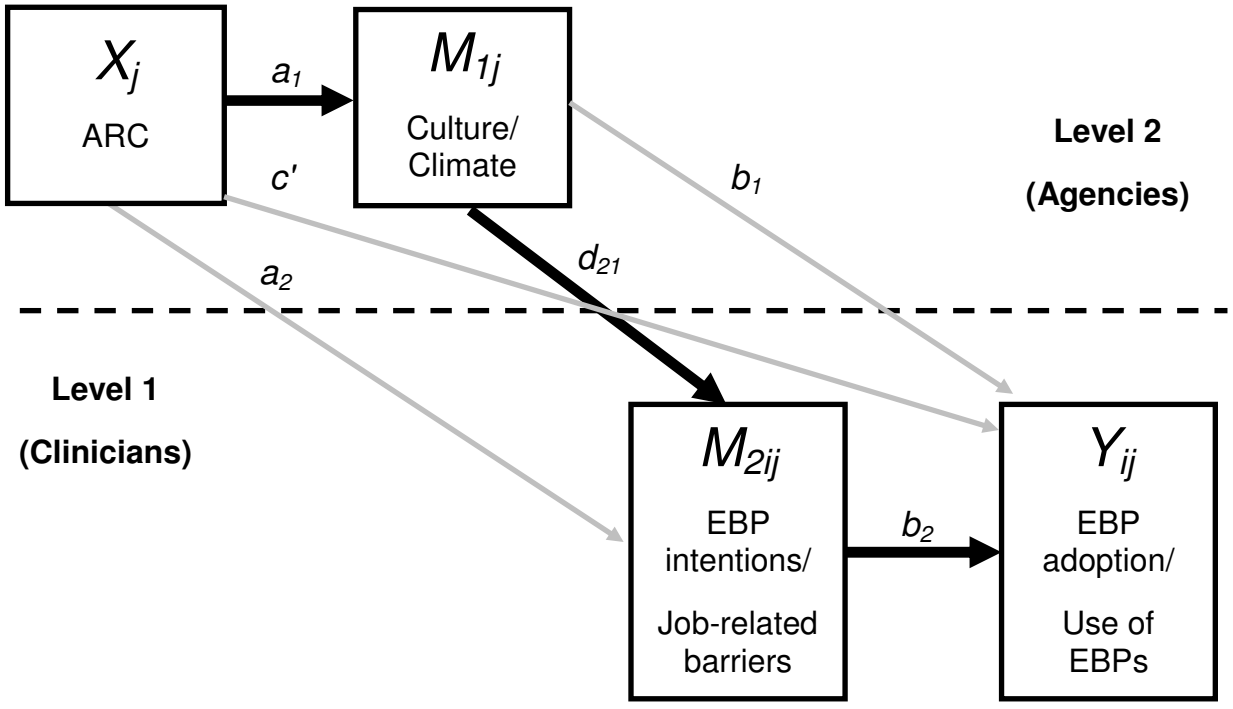


Figure 3. Multilevel Mediation Models (Hypothesized Indirect Effects in Bold)

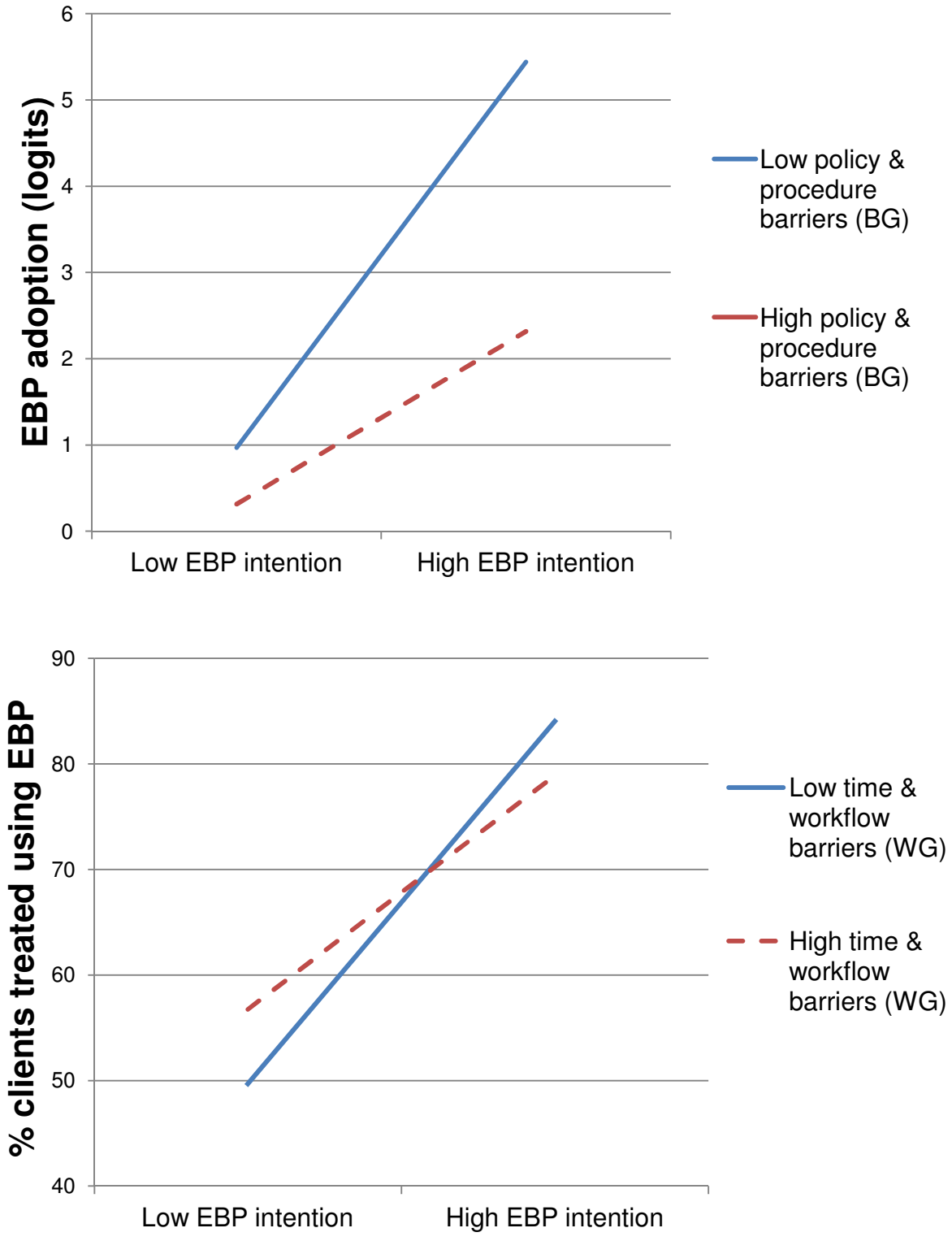


Figure 4. Interaction of EBP Intentions and Job-Related EBP Barriers for EBP Adoption

Note: BG = between-group; WG = within-group.

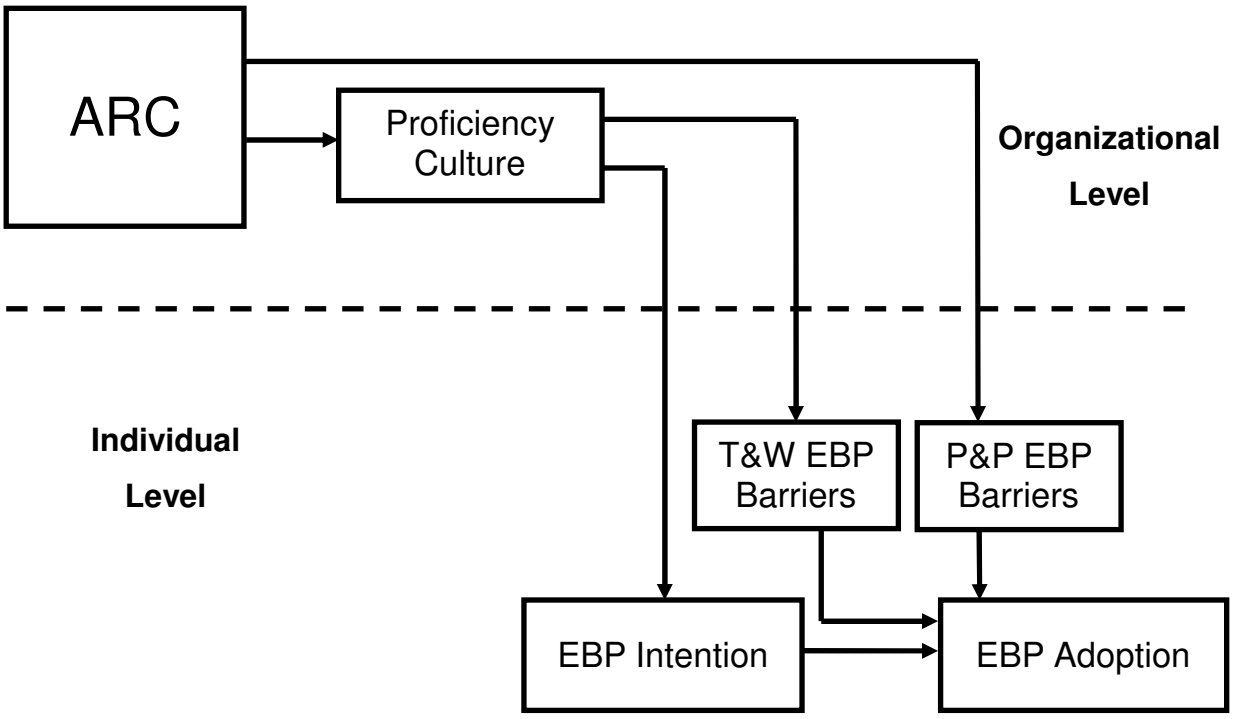


Figure 5. Revised Theoretical Model

Note: ARC = availability, responsiveness and continuity organizational intervention; EBP = evidence-based practice; T&W = time and workflow; P&P = policy and procedure.

Table 1. Confirmatory Factor Analyses Comparing Alternative Measurement Models

Model	χ^2 (*df*)	RMSEA	[90% CI]	CFI	SRMR	$\Delta\chi^2$ (*df*)	*p*
1: 1 factor (all EBP intentions & barriers items)	401.66 (90)	.11	[.10 – .12]	.65	.13		
2: 2 factors (barriers items on one scale)	242.87 (89)	.08	[.07 – .09]	.83	.10	111.66 (1)	<.001
3: 3 factors (hypothesized model [H_1])	152.87 (87)	.05	[.04 – .07]	.93	.08	83.55 (2)	<.001
4: 3 factors (H_1 w/ correlated errors)[a]	121.63 (85)	.04	[.02 – .06]	.96	.07	23.81 (2)	<.001

Note: RMSEA = root mean square error of approximation, CFI = comparative fit index, SRMR = standardized root mean square residual. Model chi-square tests incorporate the Satorra-Bentler scaling correction to account for the non-independence of observations (Satorra & Bentler, 1994). Model comparisons conducted using the Satorra-Bentler scaled chi-square difference test (Bryant & Satorra, 2012; Satorra & Bentler, 2001).

[a] Two items in the job-related policy and procedure barriers scale exhibited evidence of significant covariation beyond that accounted for by the scale factor. Similarly, two items in the time and workflow barriers scale exhibited evidence of significant covariation beyond that accounted for by the scale factor. In both cases, examination of item content suggested that similarity in wording accounted for the additional covariation and the item residual variances were allowed to correlate.

Table 2. Means, Standard Deviations, and Correlations for Agency- and Clinician-Level Variables

Variable	Mean	SD	1	2	3	4
Agency-Level[a]						
1. ARC[b]	.50	.52				
2. OSC Profile (T1)	1.70	.72	.03			
3. Proficiency culture[c] (T2)	57.48	7.18	.50	.69**		
4. Engagement climate[c] (T2)	52.18	9.20	-.23	.40	.21	
Clinician-Level[d]						
1. EBP intentions (T3)	5.24	1.47				
2. Job-related time & workflow barriers (T4)	3.33	1.36	-.33**			
3. Job-related policy & procedure barriers (T4)	2.71	1.18	-.43**	.52**		
4. EBP adoption (T4)[e]	.82	.39	.29*	-.19*	-.24*	
5. % clients treated using EBPs (T4)	70.69	31.92	.60**	-.13	-.45**	.36**

Note: ARC = Availability, Responsiveness, and Continuity organizational intervention; OSC = Organizational Social Context; T1 = Time 1; T2 = Time 2; T3 = Time 3; T4 = Time 4; EBP = evidence-based practice.

[a] $k = 14$.

[b] This variable is coded 0 = control, 1 = ARC.

[c] Values represent T-scores with $\mu = 50$ and $\sigma = 10$ based on a national sample of $k = 100$ mental health clinics (Glisson, Landsverk et al., 2008).

[d] Pairwise *n*s range from $n = 100$ to $n = 197$ due to attrition from Time 3 to Time 4 and some missing values. Results of Little's missing completely at random (MCAR) test supported the MCAR assumption, $\chi^2 = 24.08$, df = 27, $p = .626$.

[e] This variable is coded 0 = no, 1 = yes.

* $p < .05$, ** $p < .01$

Table 3. Main Effects of ARC on Clinician-Level EBP Antecedents and EBP Adoption Criteria

	EBP antecedents						EBP adoption criteria			
	EBP intentions (T3) (n=197)		Job-related P&P barriers (T4) (n=189)		Job-related T&W barriers (T4) (n=189)		EBP adoption[a] (T4) (n=171)		% clients treated w/ EBP (T4) (n=170)	
Parameter	Coeff.	*SE*	Coeff.	*SE*	Coeff.	*SE*	Coeff.	*SE*	Coeff.	*SE*
Fixed effects (γs)										
Intercept	4.99**	.22	3.05**	.22	3.33**	.18	1.10*	.37	55.76**	7.59
OSC Profile (T1)[b]	.16	.27	-.38	.21	-.34	.24	-.15	.47	-4.21	5.67
ARC[c]	.64*	.30	-.70*	.31	-.35	.34	1.16*	.39	25.12*	8.40
Variance components										
Clinician-level (σ^2)	1.96**		1.08**		1.54**		—		749.56**	
Agency-level (τ)	.13		.19		.24		.09		167.70*	
Effect size (*d* or OR)	.44		-.59		-.26		3.19[d]		.79	
Pseudo R-squared[e]	.44		.51		.27		.80		.49	
ICC(1)	.10		.27		.18		—		.30	

Note: EBP = evidence-based practice; ARC = Availability, Responsiveness, and Continuity organizational intervention; OSC = organizational social context; ICC = intraclass correlation coefficient; P&P = policy and procedure; T&W = time and workflow. These are 2-level mixed effects regression models with random agency intercepts.

[a] This variable is dichotomous (no/ yes). The model was estimated using a Bernoulli distribution with a logit link function. Note that the level 1 (clinician) variance is fixed in logistic models (i.e., $\pi^2/3$); consequently, neither the baseline ICC(1) nor the conditional clinician variance (σ^2) are reported.

[b] Grand mean centered.

[c] Coded 0 = control, 1 = ARC.

[d] This value is an odds ratio.

[e] Calculated as $(\tau_{\text{unconditional}} - \tau_{\text{conditional}}) / \tau_{\text{unconditional}}$

* $p < .05$, *** $p \leq .001$

Table 4. 2-2-1 Mediation Analysis Linking ARC, Proficiency Culture, and EBP Intentions

		Consequent						
		M_1 (Proficiency culture)[a] (T2)				Y (EBP intentions)[b] (T3)		
Antecedent		*B*	*SE*	*p*		*γ*	*SE*	*p*
ARC	*a*	6.91	2.49	.020	*c'*	.06	.63	.928
Proficiency culture (T2)		—	—	—	*b*	.08	.04	.045
OSC profile (T1)		7.19	2.03	.005		-.36	.21	.087
Intercept		41.97	3.79	<.001		5.22	.19	<.001

Indirect effect of ARC on EBP intentions (T3)					
Mediator:		Effect	Monte Carlo LL 95% CI	Monte Carlo UL 95% CI	Joint sig. test
Proficiency culture (T2)	*ab*	.56	.01	1.38	*Sig.*

Note: EBP = evidence-based practice; ARC = Availability, Responsiveness, and Continuity organizational intervention; OSC = organizational social context.

[a] $k = 13$ agencies. This is a single-level multiple regression model; $F(2, 10) = 8.97$, $p = .006$, $R^2 = .64$.

[b] $k = 13$ agencies, $n = 197$ clinicians. This is a 2-level mixed effects regression model with random agency intercepts.

Table 5. 2-2-1 Mediation Analysis Linking ARC, Proficiency Culture, and Policy and Procedure EBP Barriers

		Consequent						
		M_1 (Proficiency culture)[a] (T2)				Y (P&P EBP barriers)[b] (T4)		
Antecedent		*B*	*SE*	*p*		*γ*	*SE*	*p*
ARC	*a*	6.59	2.28	.015	*c'*	-.59	.33	.070
Proficiency culture (T2)		—	—	—	*b*	-.02	.03	.531
OSC profile (T1)		6.73	1.65	.002		-.28	.30	.363
Intercept		42.75	3.20	<.001		3.01	.22	<.001

Indirect effect of ARC on P&P EBP barriers (T4)					
Mediator:		Effect	Monte Carlo LL 95% CI	Monte Carlo UL 95% CI	Joint sig. test
Proficiency culture (T2)	*ab*	-.13	-.60	.27	*Not sig.*

Note: P&P = job-related policy and procedure; ARC = Availability, Responsiveness, and Continuity organizational intervention; OSC = organizational social context.

[a] k = 14 agencies. This is a single-level multiple regression model; $F(2, 11) = 12.89$, $p = .001$, $R^2 = .70$.

[b] k = 14 agencies, n = 189 clinicians. This is a 2-level mixed effects regression model with random agency intercepts.

Table 6. 2-2-1 Mediation Analysis Linking ARC, Proficiency Culture, and Time and Workflow EBP Barriers

		Consequent						
		M_1 (Proficiency culture)[a] (T2)				Y (T&W EBP barriers)[b] (T4)		
Antecedent		*B*	*SE*	*p*		*γ*	*SE*	*p*
ARC	*a*	6.59	2.28	.015	*c'*	.50	.37	.174
Proficiency culture (T2)		—	—	—	*b*	-.123	.03	<.001
OSC profile (T1)		6.73	1.65	.002		.42	.26	.104
Intercept		42.75	3.20	<.001		3.08	.15	<.001

Indirect effect of ARC on T&W EBP barriers (T4)					
Mediator:		Effect	Monte Carlo LL 95% CI	Monte Carlo UL 95% CI	Joint sig. test
Proficiency culture (T2)	*ab*	-.81	-1.55	-.23	*Sig.*

Note: T&W = job-related time and workflow; ARC = Availability, Responsiveness, and Continuity organizational intervention; OSC = organizational social context.

[a] k = 14 agencies. This is a single-level multiple regression model; $F(2, 11) = 12.89$, $p = .001$, $R^2 = .70$.

[b] k = 14 agencies, n = 189 clinicians. This is a 2-level mixed effects regression model with random agency intercepts.

Table 7. Moderation Analyses of EBP Intentions and Job-Related EBP Barriers Predicting EBP Adoption

	EBP adoption[a] (T4)			% clients treated w/ EBPs[b] (T4)		
Variable	Coeff.	*SE*	*p*	Coeff.	*SE*	*p*
Moderator: P&P EBP barriers (T4)						
Level 2						
Intercept	1.99	.26	<.001	71.83	5.82	<.001
OSC profile (T1)	-.54	.24	.024	-10.52	10.28	.306
EBP intentions-BG (T3)[c]	2.19	.49	<.001	21.19	5.67	<.001
P&P EBP barriers-BG (T4)[c]	-1.01	.49	.040	-8.87	5.81	.127
Intentions (T3) x barriers-BG (T4)[c]	-1.46	.53	.006	4.53	8.45	.592
Level 1						
EBP intentions-WG (T3)[d]	.23	.27	.391	9.54	1.47	<.001
P&P EBP barriers-WG (T4)[d]	-.16	.29	.582	-3.88	3.43	.258
Intentions (T3) x barriers-WG (T4)[d]	-.09	.26	.730	.57	.86	.507
Variance components						
Clinician-level (σ^2)	-			539.98		
Agency-level (τ)	.00			54.01		
Moderator: T&W EBP barriers (T4)						
Level 2						
Intercept	1.98	.39	<.001	67.84	3.12	<.001
OSC profile (T1)	-.21	.52	.693	-7.72	6.24	.216
EBP intentions-BG (T3)[c]	1.85	.37	<.001	30.98	4.37	<.001
T&W EBP barriers-BG (T4)[c]	.02	.46	.965	7.29	5.08	.151
Intentions (T3) x barriers-BG (T4)[c]	-.01	.32	.972	-1.60	7.04	.820
Level 1						
EBP intentions-WG (T3)[d]	.19	.18	.291	11.46	1.71	<.001
T&W EBP barriers-WG (T4)[d]	-.23	.21	.277	.32	1.42	.822
Intentions (T3) x barriers-WG (T4)[d]	-.01	.22	.950	-2.28	.80	.004
Variance components						
Clinician-level (σ^2)	-			538.21		
Agency-level (τ)	.00			45.13		

Note: EBP = evidence-based practice; P&P = job-related policy and procedure; T&W = job-related time and workflow.

[a] k = 13, n = 104. Two-level mixed effects regression model with random agency intercepts; incorporates a Bernoulli distribution and logit link function to account for the binary dependent variable.

[b] $k = 13$, $n = 101$. Two-level mixed effects regression model with random agency intercepts.

[c] Values are between-group agency means based on the centered within context with means reintroduced approach (Zhang, Zyphur, & Preacher, 2009). Variable centered prior to analysis.

[d] Values are clinicians' within-group deviation from their group mean (i.e., group mean centered) based on the centered within context with means reintroduced approach.

Table 8. 2-2-1-1 Serial Mediation Analysis Linking ARC, Proficiency Culture, EBP Intentions, and EBP Adoption

		Consequent									
		M_1 (Proficiency culture)[a] (T2)				M_2 (EBP intentions)[b] (T3)				Y (EBP adoption)[c] (T4)	
Antecedent		*B*	*SE*	*p*		*γ*	*SE*	*p*		*γ*	*SE*	*p*
ARC	a_1	6.91	2.49	.020	a_2	.32	.28	.262	c'	.92	.61	.127
Proficiency culture (T2)		—	—	—	d_{21}	.09	.03	<.001	b_1	-.05	.07	.451
EBP intentions-BG (T3)[d]		—	—	—		—	—	—	b_2	1.75	.60	.003
EBP intentions-WG (T3)[d]		—	—	—		—	—	—		.25	.20	.217
OSC profile (T1)		7.19	2.03	.005		-.30	.29	.310		.13	.63	.834
Intercept		41.97	3.79	<.001		5.09	.18	<.001		1.66	.36	<.001

Indirect effects of ARC on EBP adoption (T4)

Specific indirect effect through:		Effect	Monte Carlo LL 95% CI	Monte Carlo UL 95% CI	Joint sig. test
Proficiency culture (T2)	a_1b_1	-.35	-1.51	.63	*Not sig.*
EBP intentions-BG (T3)	a_2b_2	.56	-.40	1.80	*Not sig.*
Proficiency culture (T2) & EBP intentions-BG (T3)	$a_1d_{21}b_2$	1.12	.17	2.74	*Sig.*

Note: EBP = evidence-based practice; ARC = Availability, Responsiveness, and Continuity organizational intervention; OSC = organizational social context; T1 = time 1; T2 = time 2; T3 = time 3; T4 = time 4.

[a] k = 13 agencies. This is a single-level multiple regression model. $F(2, 10) = 8.97$, $p = .006$, $R^2 = .64$, ΔR^2 associated with ARC = .28.

[b] k = 13 agencies; n = 105 clinicians. This is a 2-level mixed effects regression model with random agency intercepts.

[c] k = 13 agencies; n = 105 clinicians. This is a 2-level mixed effects regression model with random agency intercepts; the model incorporates a Bernoulli distribution with a logit link function to account for the binary outcome.

[d] This variable is centered within context with means reintroduced (CWC[M]). Zhang, Zyphur, & Preacher (2009) describe the CWC(M) method for obtaining non-biased estimates of cross-level mediation effects and accurate Type 1 error rates in multilevel mediation models where the independent variable, *X*, is at level 2 (i.e., agency level) and the mediator, *M*, is at level 1 (i.e., clinician level). Variance in the level-1 mediator is partitioned into between-group (BG) and within-

group (WG) components and both are entered simultaneously into the model predicting *Y*. The coefficient for the between-group component provides an unbiased estimate of the cross-level *b* path and is used in calculating the indirect effects.

Table 9. 2-2-1-1 Serial Mediation Analysis Linking ARC, Proficiency Culture, EBP Intentions, and Percentage of Clients Treated Using EBPs

		Consequent									
		M_1 (Proficiency culture)[a] (T2)				M_2 (EBP intentions)[b] (T3)				Y (% clients treated w/ EBP)[c] (T4)	
Antecedent		*B*	*SE*	*p*		*γ*	*SE*	*p*		*γ*	*SE*	*p*
ARC	a_1	6.91	2.49	.020	a_2	.24	.31	.440	c'	13.90	8.73	.111
Proficiency culture (T2)		—	—	—	d_{21}	.09	.02	<.001	b_1	-.65	.91	.478
EBP intentions-BG (T3)[d]		—	—	—		—	—	—	b_2	24.32	5.36	<.001
EBP intentions-WG (T3)[d]		—	—	—		—	—	—		10.69	1.47	<.001
OSC profile (T1)		7.19	2.03	.005		-.40	.29	.168		-6.04	7.44	.417
Intercept		41.97	3.79	<.001		5.16	.23	<.001		60.82	4.15	<.001

Indirect effects of ARC on percentage of clients treated using EBP (T4)

Specific indirect effect through:		Effect	Monte Carlo LL 95% CI	Monte Carlo UL 95% CI	Joint sig. test
Proficiency culture (T2)	a_1b_1	-4.49	-19.73	8.17	*Not sig.*
EBP intentions-BG (T3)	a_2b_2	5.84	-9.05	22.25	*Not sig.*
Proficiency culture (T2) & EBP intentions-BG (T3)	$a_1d_{21}b_2$	15.63	3.71	33.31	*Sig.*

Note: EBP = evidence-based practice; ARC = Availability, Responsiveness, and Continuity organizational intervention; OSC = organizational social context; T1 = time 1; T2 = time 2; T3 = time 3; T4 = time 4; LL = lower limit; UL = upper limit.

[a] k = 13 agencies. This is a single-level multiple regression model, $F(2, 10) = 8.97$, $p = .006$, $R^2 = .64$, ΔR^2 associated with ARC = .28.

[b] k = 13 agencies; n = 100 clinicians. This is a 2-level mixed effects regression model with random agency intercepts.

[c] k = 13 agencies; n = 100 clinicians. This is a 2-level mixed effects regression model with random agency intercepts.

[d] This variable is centered within context with means reintroduced (CWC[M]). Zhang, Zyphur, & Preacher (2009) describe the CWC(M) method for obtaining non-biased estimates of cross-level mediation effects and accurate Type 1 error rates in multilevel mediation models where the independent variable, *X*, is at level 2 (i.e., agency level) and the mediator, *M*, is at level 1 (i.e., clinician level). Variance in the level-1 mediator is partitioned into between-group (BG) and within-

group (WG) components and both are entered simultaneously into the model predicting *Y*. The coefficient for the between-group component provides an unbiased estimate of the cross-level *b* path and is used in calculating the indirect effects.

Table 10. 2-2-1-1 Serial Mediation Analysis Linking ARC, Proficiency Culture, Time and Workflow EBP Barriers, and EBP Adoption

		Consequent										
		M_1 (Proficiency culture)[a] (T2)				M_2 (T&W EBP barriers)[b] (T4)				Y (EBP adoption)[c] (T4)		
Antecedent		*B*	*SE*	*p*		*γ*	*SE*	*p*		*γ*	*SE*	*p*
ARC	a_1	6.59	2.28	.015	a_2	.47	.22	.034	c'	1.40	.58	.015
Proficiency culture (T2)		—	—	—	d_{21}	-.14	.02	<.001	b_1	-.05	.09	.527
T&W EBP barriers-BG (T4)[d]		—	—	—		—	—	—	b_2	-1.43	.64	.025
T&W EBP barriers-WG (T4)[d]		—	—	—		—	—	—		-.25	.22	.264
OSC profile (T1)		6.73	1.65	.002		.51	.25	.046		-.51	.46	.271
Intercept		42.75	3.20	<.001		3.11	.18	<.001		1.14	.29	<.001

Indirect effects of ARC on EBP adoption (T4)

Specific indirect effect through:		Effect	Monte Carlo LL 95% CI	Monte Carlo UL 95% CI	Joint sig. test
Proficiency culture (T2)	a_1b_1	-.36	-1.71	.89	*Not sig.*
T&W EBP barriers-BG (T4)	a_2b_2	-.68	-1.74	.02	*Sig.*
Proficiency culture (T2) & T&W EBP barriers-BG (T4)	$a_1d_{21}b_2$	1.28	.09	3.19	*Sig.*

Note: EBP = evidence-based practice; ARC = Availability, Responsiveness, and Continuity organizational intervention; OSC = organizational social context; TW = time & workflow; T1 = time 1; T2 = time 2; T3 = time 3; T4 = time 4; LL = lower limit; UL = upper limit.

[a] k = 14 agencies. This is a single-level multiple regression model, $F(2, 11) = 12.89$, $p = .001$, $R^2 = .70$.

[b] k = 14 agencies; n = 169 clinicians. This is a 2-level mixed effects regression model with random agency intercepts.

[c] k = 14 agencies; n = 169 clinicians. This is a 2-level mixed effects regression model with random agency intercepts; the model incorporates a Bernoulli distribution with a logit link function to account for the binary outcome.

[d] This variable is centered within context with means reintroduced (CWC[M]). Zhang, Zyphur, & Preacher (2009) describe the CWC(M) method for obtaining non-biased estimates of cross-level mediation effects and accurate Type 1 error rates in multilevel mediation models where the independent variable, *X*, is at level 2 (i.e., agency level) and the mediator, *M*, is at level 1 (i.e., clinician level). Variance in the level-1 mediator is partitioned into between-group (BG) and within-

group (WG) components and both are entered simultaneously into the model predicting *Y*. The coefficient for the between-group component provides an unbiased estimate of the cross-level *b* path and is used in calculating the indirect effects.

Table 11. 2-2-1-1 Serial Mediation Analysis Linking ARC, Proficiency Culture, Time and Workflow EBP Barriers, and Percentage of Clients Treated Using EBPs

		Consequent									
		M_1 (Proficiency culture)[a] (T2)			M_2 (T&W EBP barriers)[b] (T4)				Y (%clients treated w/ EBPs)[c] (T4)		
Antecedent		*B*	*SE*	*p*		*γ*	*SE*	*p*		*γ*	*SE*	*p*
ARC	a_1	6.59	2.28	.015	a_2	.54	.18	.002	c'	13.41	10.62	.207
Proficiency culture (T2)		—	—	—	d_{21}	-.12	.03	<.001	b_1	1.75	1.25	.163
T&W EBP barriers-BG (T4)[d]		—	—	—		—	—	—	b_2	-1.26	6.76	.853
T&W EBP barriers-WG (T4)[d]		—	—	—		—	—	—		-1.66	1.79	.353
OSC profile (T1)		6.73	1.65	.002		.49	.30	.107		-16.16	9.38	.085
Intercept		42.75	3.20	<.001		3.00	.14	<.001		60.34	6.80	<.001

Indirect effects of ARC on percentage of clients treated using EBP (T4)

Specific indirect effect through:		Effect	Monte Carlo LL 95% CI	Monte Carlo UL 95% CI	Joint sig. test
Proficiency culture (T2)	a_1b_1	11.53	-4.46	33.26	*Not sig.*
T&W EBP barriers-BG (T4)	a_2b_2	-.68	-8.71	6.98	*Not sig.*
Proficiency culture (T2) & T&W EBP barriers-BG (T4)	$a_1d_{21}b_2$	1.02	-10.93	13.67	*Not sig.*

Note: ARC = Availability, Responsiveness, and Continuity organizational intervention; EBP = evidence-based practice; OSC = organizational social context; TW = time and workflow; T1 = time 1; T2 = time 2; T3 = time 3; T4 = time 4; LL = lower limit; UL = upper limit.

[a] k = 14 agencies. This is a single-level multiple regression model, $F(2, 11) = 12.89$, $p = .001$, $R^2 = .70$.

[b] k = 14 agencies; n = 170 clinicians. This is a 2-level mixed effects regression model with random agency intercepts.

[c] k = 14 agencies; n = 170 clinicians. This is a 2-level mixed effects regression model with random agency intercepts.

[d] This variable is centered within context with means reintroduced (CWC[M]). Zhang, Zyphur, & Preacher (2009) describe the CWC(M) method for obtaining non-biased estimates of cross-level mediation effects and accurate Type 1 error rates in multilevel mediation models where the independent variable, *X*, is at level 2 (i.e., agency level) and the mediator, *M*, is at level 1 (i.e., clinician level). Variance in the level-1 mediator is partitioned into between-group (BG) and within-

group (WG) components and both are entered simultaneously into the model predicting *Y*. The coefficient for the between-group component provides an unbiased estimate of the cross-level *b* path and is used in calculating the indirect effects.

Table 12. Conditional Indirect Effects of ARC on EBP Adoption through Proficiency Culture and EBP Intentions as Moderated by Job-Related EBP Barriers

	EBP adoption[a] (T4)			% clients treated w/ EBPs[b] (T4)		
Variable	Coeff.	*SE*	*p*	Coeff.	*SE*	*p*
Moderator: P&P EBP barriers (T4)						
Level 2						
Intercept	1.89	.38	<.001	67.41	5.78	<.001
ARC	.22	.91	.807	11.28	8.86	.203
OSC profile (T1)	-.42	.90	.638	-6.38	9.63	.508
Proficiency culture (T2)	-.01	.11	.924	-.41	1.07	.701
EBP intentions-BG (T3)[c]	2.13	.83	.010	20.92	8.00	.009
P&P EBP barriers-BG (T4)[c]	-.85	.85	.315	-5.12	6.39	.423
Intentions (T3) x barriers-BG (T4)[c]	-1.30	.68	.056	4.81	6.98	.491
Level 1						
EBP intentions-WG (T3)[d]	.23	.27	.394	9.59	1.46	<.001
P&P EBP barriers-WG (T4)[d]	-.16	.29	.590	-3.87	3.93	.254
Intentions (T3) x barriers-WG (T4)[d]	-.09	.26	.724	.38	.92	.678
Clinician-level variance component (σ^2)	-			546.02		
Agency-level variance component (τ)	.00			30.08		
Moderator: T&W EBP barriers (T4)						
Level 2						
Intercept	1.65	.31	<.001	62.97	3.93	<.001
ARC	1.14	.74	.123	8.62	6.27	.170
OSC profile (T1)	.30	.62	.628	-10.59	7.30	.147
Proficiency culture (T2)	-.12	.12	.302	.87	1.11	.436
EBP intentions-BG (T3)[c]	1.93	.66	.003	24.57	5.74	<.001
T&W EBP barriers-BG (T4)[c]	-.37	.66	.574	9.55	5.35	.074
Intentions (T3) x barriers-BG (T4)[c]	.15	.22	.484	-1.74	6.09	.776
Level 1						
EBP intentions-WG (T3)[d]	.19	.18	.314	11.50	1.75	<.001
T&W EBP barriers-WG (T4)[d]	-.23	.22	.298	.31	1.41	.827
Intentions (T3) x barriers-WG (T4)[d]	.00	.24	.999	-2.41	.84	.004
Clinician-level variance component (σ^2)	-			547.03		
Agency-level variance component (τ)	.00			7.17		

Note: ARC = Availability, Responsiveness, and Continuity organizational intervention; EBP = evidence-based practice; OSC = organizational social context; T&W = time and workflow; T1 = time 1; T2 = time 2; T3 = time 3; T4 = time 4.

[a] k = 13 agencies; n = 104 clinicians. This is a 2-level mixed effects regression model with random agency intercepts; the model incorporates a Bernoulli distribution with a logit link function to account for the binary outcome.

[b] k = 13 agencies; n = 100 clinicians. This is a 2-level mixed effects regression model with random agency intercepts.

[c] Values are between-group agency means based on the centered within context with means reintroduced approach (Zhang, Zyphur, & Preacher, 2009). Variable centered prior to analysis.

[d] Values are clinicians' within-group deviation from their group mean (i.e., group mean centered) based on the centered within context with means reintroduced approach.

Table 13. Simultaneous 2-2-1-1 Serial Mediation Analysis Linking ARC, Proficiency Culture, EBP Intentions, Time and Workflow EBP Barriers, and Percentage of Clients Treated Using EBPs

		Consequent													
		M_1 (Proficiency culture)[a] (T2)				M_{2a} (EBP intentions)[b] (T3)				M_{2b} (T&W EBP barriers)[b] (T4)				*Y* (% clients treated using EBPs)[c] (T4)	
Antecedent		*B*	*SE*	*p*		*γ*	*SE*	*p*		*γ*	*SE*	*p*		*γ*	*SE*	*p*
ARC	a_1	6.91	2.49	.020	a_2	.24	.31	.440	a_3	.57	.38	.132	c'	9.66	7.42	.193
Proficiency culture (T2)		—	—	—	d_{21}	.09	.02	<.001	d_{31}	-.14	.04	<.001	b_1	.54	1.10	.625
EBP intentions-BG (T3)[d]		—	—	—		—	—	—		—	—	—	b_2	24.69	5.82	<.001
T&W EBP barriers-BG (T4)[d]		—	—	—		—	—	—		—	—	—	b_3	9.20	6.89	.182
EBP intentions-WG (T3)[d]		—	—	—		—	—	—		—	—	—		10.79	1.64	<.001
T&W EBP barriers-WG (T4)[d]		—	—	—		—	—	—		—	—	—		.49	1.45	.735
OSC profile (T1)		7.19	2.03	.005		-.40	.29	.168		.61	.41	.137		-10.19	8.55	.233
Intercept		41.97	3.79	<.001		5.16	.23	<.001		2.91	.20	<.001		64.21	3.49	<.001

Indirect effects of ARC on percentage of clients treated using EBPs (T4)

Specific indirect effect through:		Effect	Monte Carlo LL 95% CI	Monte Carlo UL 95% CI	Joint sig. test
Proficiency culture (T2)	a_1b_1	3.73	-12.02	21.53	*Not sig.*
EBP intentions-BG (T3)	a_2b_2	5.93	-9.28	22.56	*Not sig.*
T&W EBP barriers-BG (T4)	a_3b_3	5.24	-3.45	19.58	*Not sig.*
Proficiency culture (T2) & EBP intentions-BG (T3)	$a_1d_{21}b_2$	15.35	3.43	33.11	*Sig.*
Proficiency culture (T2) & T&W EBP barriers-BG (T4)	$a_1d_{31}b_3$	-8.90	-29.20	3.83	*Not sig.*

Note: EBP = evidence-based practice; T&W = job-related time and workflow; ARC = Availability, Responsiveness, and Continuity organizational intervention; OSC = organizational social context; T1 = time 1; T2 = time 2; T3 = time 3; T4 = time 4; LL = lower limit; UL = upper limit.

[a] k = 13 agencies. This is a single-level multiple regression model estimated using ordinary least squares, $F(2, 10) = 8.97$, $p = .006$, $R^2 = .64$, ΔR^2 associated with ARC = .28.

[b] k = 13 agencies; n = 100 clinicians. This is a 2-level mixed effects regression model with random agency intercepts.

[c] k = 13 agencies; n = 100 clinicians. This is a 2-level mixed effects regression model with random agency intercepts.

[d] This variable is centered within context with means reintroduced (CWC[M]). Zhang, Zyphur, & Preacher (2009) describe the CWC(M) method for obtaining non-biased estimates of cross-level mediation effects and accurate Type 1 error rates in multilevel mediation models where the independent variable, *X*, is at level 2 (i.e., agency level) and the mediator, *M*, is at level 1 (i.e., clinician level). Variance in the level-1 mediator is partitioned into between-group (BG) and within-group (WG) components and both are entered simultaneously into the model predicting *Y*. The coefficient for the between-group component provides an unbiased estimate of the cross-level *b* path and is used in calculating the indirect effects.

Table 14. 2-1-1 Mediation Analysis Linking ARC, Policy and Procedure EBP Barriers, and Percentage of Clients Treated Using EBPs

		Consequent						
		M_1 (P&P EBP barriers)[a] (T4)				Y (% clients treated using EBPs)[b] (T4)		
Antecedent		*B*	*SE*	*p*		*γ*	*SE*	*p*
ARC	*a*	-.71	.30	.019	*c'*	12.54	6.95	.071
P&P EBP barriers-BG (T4)[c]		—	—	—	*b*	-17.46	5.35	.001
P&P EBP barriers-WG (T4)[c]		—	—	—		-9.40	2.18	<.001
OSC profile (T1)		-.29	.20	.140		-8.89	5.25	.090
Intercept		3.00	.23	<.000		62.60	6.29	<.001

Indirect effect of ARC on % clients treated using EBPs (T4)

Mediator:		Effect	Monte Carlo LL 95% CI	Monte Carlo UL 95% CI	Joint sig. test
P&P EBP barriers-BG (T4)	*ab*	12.47	1.52	27.67	*Sig.*

Note: ARC = Availability, Responsiveness, and Continuity organizational intervention; EBP = evidence-based practice; P&P = job-related policy and procedure; OSC = organizational social context.

[a] k = 14 agencies, n = 170 clinicians. This is a 2-level mixed effects regression model with random agency intercepts.

[b] k = 14 agencies, n = 170 clinicians. This is a 2-level mixed effects regression model with random agency intercepts.

[c] This variable is centered within context with means reintroduced (CWC[M]). Zhang, Zyphur, & Preacher (2009) describe the CWC(M) method for obtaining non-biased estimates of cross-level mediation effects and accurate Type 1 error rates in multilevel mediation models where the independent variable, *X*, is at level 2 (i.e., agency level) and the mediator, *M*, is at level 1 (i.e., clinician level). Variance in the level-1 mediator is partitioned into between-group (BG) and within-group (WG) components and both are entered simultaneously into the model predicting *Y*. The coefficient for the between-group component provides an unbiased estimate of the cross-level *b* path and is used in calculating the indirect effects.

Table 15. 2-1-1 Mediation Analysis Linking ARC, Policy and Procedure EBP Barriers, and EBP Adoption

		Consequent						
		M_1 (P&P EBP barriers)[a] (T4)				Y (EBP adoption)[b] (T4)		
Antecedent		*B*	*SE*	*p*		*γ*	*SE*	*p*
ARC	*a*	-.77	.34	.024	*c'*	.63	.36	.075
P&P EBP barriers-BG (T4)[c]		—	—	—	*b*	-.90	.30	.003
P&P EBP barriers-WG (T4)[c]		—	—	—		-.37	.22	.099
OSC profile (T1)		-.33	.24	.182		-.49	.32	.124
Intercept		3.14	.25	<.001		1.39	.26	<.001

Indirect effect of ARC on EBP adoption (T4)

Mediator:		Effect	Monte Carlo LL 95% CI	Monte Carlo UL 95% CI	Joint sig. test
P&P EBP barriers-BG (T4)	*ab*	.69	.06	1.60	*Sig.*

Note: ARC = Availability, Responsiveness, and Continuity organizational intervention; EBP = evidence-based practice; P&P = job-related policy and procedure; OSC = organizational social context.

[a] k = 14 agencies, n = 169 clinicians. This is a 2-level mixed effects regression model with random agency intercepts.

[b] k = 14 agencies, n = 169 clinicians. This is a 2-level mixed effects regression model with random agency intercepts; the model incorporates a Bernoulli distribution with a logit link function to account for the binary outcome.

[c] This variable is centered within context with means reintroduced (CWC[M]). Zhang, Zyphur, & Preacher (2009) describe the CWC(M) method for obtaining non-biased estimates of cross-level mediation effects and accurate Type 1 error rates in multilevel mediation models where the independent variable, *X*, is at level 2 (i.e., agency level) and the mediator, *M*, is at level 1 (i.e., clinician level). Variance in the level-1 mediator is partitioned into between-group (BG) and within-group (WG) components and both are entered simultaneously into the model predicting *Y*. The coefficient for the between-group component provides an unbiased estimate of the cross-level *b* path and is used in calculating the indirect effects.

Vita

Nathaniel Williams earned his Bachelor of Arts degree in Social Science in 2002 and his Master of Social Work degree in 2004 at Boise State University in Boise, Idaho. After graduation, Nathaniel worked for seven years as an outpatient mental health clinician with children and families. During this time, he earned his License in Clinical Social Work (LCSW) and was promoted to program director of a community- and school-based mental health program for youth. In 2011 he entered the Ph.D. program in the College of Social Work at the University of Tennessee and was awarded a research assistanceship in the College's Children's Mental Health Services Research Center. The following year, he received a Ruth L. Kirschstein National Research Service Award (F31) from the National Institute of Mental Health. This three-year individual pre-doctoral fellowship provided funding for his dissertation research, stipend, funds for advanced training in quantitative methods, and opportunities to collaborate with distinguished children's mental health services researchers across the United States. Nathaniel graduated with his Doctor of Philosophy degree in Social Work with a Minor in Statistics in August 2015.