

Motivational Interviewing Fidelity and Health Outcomes for Young People Living with HIV

Laurie Josephs

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Executive Summary

Background

Globally, young people (YP) aged 10-25 are disproportionately affected by the human immunodeficiency virus (HIV). Estimates suggest that 510,000 YP worldwide have been diagnosed with HIV in the last year, accounting for 30% of all new HIV infections (United Nations International Children's Emergency Fund [UNICEF], 2019). The introduction of antiretroviral therapy (ART), which suppresses replication of the HIV virus in the blood, has transformed the management of HIV from a fatal illness to a chronic condition. However, YP continue to be the only age group in which HIV-related deaths are increasing (Idele et al., 2014).

YP living with HIV face unique challenges in sustaining successful self-management of the condition during a period characterised by substantial physical, emotional and behavioural transitions (Arnett, 2014). In addition, alcohol consumption peaks in this age group, particularly in YP living with HIV (Tanney et al., 2010). Navigating these normative tasks of adolescence (ages 10-19 years) and emerging adulthood (ages 20-25 years) are compounded for YP living with and managing the demands of a stigmatised chronic condition such as HIV. Subsequently, ART adherence is significantly reduced in YP living with HIV (Kim et al., 2014). Optimal ART adherence can reduce viral load, the amount of detectable HIV in the blood. Undetectable viral load affords YP living with HIV improved overall health and reduced risk of onward transmission. Furthermore, alcohol consumption not only exacerbates poor ART adherence, but also directly impacts viral load and increases HIV-related health problems (MacDonell et al., 2013). It has been argued that there are critical gaps in both knowledge and understanding of psychological interventions addressing these factors for YP living with HIV (STOP AIDS, 2016).

Motivational Interviewing (MI) has been established as an effective approach for improving health outcomes in both adults and YP generally (Schaefer & Kavookjian, 2017; VanBuskirk & Wetherell, 2014). More recently, research has emerged demonstrating the efficacy of MI in improving viral load and reducing alcohol consumption in YP living with HIV (Murphy et al., 2012; Naar et al., 2009). However, as MI is typically delivered by mental health professionals, access to such interventions is limited. This is particularly the case for YP living with HIV who face additional barriers to access such as anticipated HIV stigma (i.e. the expectation and belief that one will experience prejudice and discrimination from others based on one's HIV status: Earnshaw & Chaudoir, 2009) and subsequently fear being seen at an HIV clinic by the community (United Nations Programme for HIV/AIDS [UNAIDS], 2018). Promising research has identified the effectiveness of task-sharing approaches, whereby paraprofessionals without formal mental health training are trained to deliver MI (Naar et al., 2009). A recent randomised controlled trial (RCT) trained paraprofessionals within existing HIV services to deliver MI in both the clinic and home setting (Naar et al., under review). Home-based delivery of interventions have been suggested to further improve access, engagement and sustainable outcomes (Gopalan et al., 2010; Snowden et al., 2006). However, contrary to the original hypotheses, improved outcomes for YP were found in the clinic setting. One hypothesis is that paraprofessionals fidelity to MI, or how adherent they are to implementing specific MI skills, accounts for differences in these outcomes across settings.

It has been argued that more “theoretically based research” (Thrasher et al., 2006, p.64) is required to understand exactly how MI produces clinical benefit (Magill et al., 2018). One hypothesised pathway is that therapists' use of specific MI skills, and thus fidelity to MI, is crucial in eliciting behaviour change (McCambridge et al., 2011; Moyers et al., 2007;

Rollnick, 2001). Research in the adult MI literature has provided evidence for this relationship (Apodaca & Longabaugh, 2009; Copeland et al., 2015), but this remains under-researched in YP living with HIV, particularly when MI is delivered by paraprofessionals. Understanding the impact of MI skills and the quality of MI on health and behavioural outcomes for YP living with HIV is crucial for improving and tailoring both MI training and delivery of MI interventions to YP.

Systematic Review

Research has demonstrated the effectiveness of MI in improving outcomes and eliciting behaviour change in YP (Schaefer & Kavookjian, 2017). As such, there has been a shift towards MI process research to understand the mechanisms through which MI produces clinical benefit (Magill et al., 2018). A causal model of MI efficacy proposes a 'technical pathway' in which therapist MI skills elicit client change talk, which ultimately predicts behaviour change (Miller & Rose, 2009). Evidence from the adult literature provides support for this, but it remains unclear as to whether therapist MI skills are associated with outcomes for YP.

The current systematic review synthesised the existing literature on the relationship between therapist MI skills and a variety of behavioural and health related outcomes for YP. Quantitative studies were included if they involved an MI intervention with YP aged 12-25 years, a measure of therapist MI skills (e.g. the Motivational Interviewing Treatment Integrity code (MITI: Moyers et al., 2014) and a measure of outcomes for YP. Studies were also required to have statistically analysed the relationship between MI skills and outcomes. Key information relating to the study characteristics, participants, MI therapists and main

findings was extracted from the data. The methodological quality of the studies was assessed using the Mixed Methods Assessment Tool (MMAT: Pluye et al., 2011).

A total of 18 studies (across 15 articles) met criteria for inclusion in the review. A narrative synthesis of the data and key findings was undertaken. Of the 18 eligible studies, the majority demonstrated an association between specific MI skills and YP outcomes. However, the directions of the relationships were varied and inconsistent. Four studies found no relationship between outcomes for YP and MI skills. The most consistent findings were: (1) greater levels of therapist MI spirit (i.e. fostering collaboration, promoting autonomy and evoking the client's ideas about change) were related to improved outcomes for YP; (2) greater levels of therapist MI non-adherent behaviours were related to poorer outcomes and (3) MI-adherent behaviours were unrelated to outcomes.

The review provided tentative evidence for an association between MI skills and outcomes for YP, particularly MI spirit, MI non-adherent and MI-adherent behaviours, but the findings are largely inconsistent. It was also acknowledged that MI process research in YP is in its infancy. It is therefore difficult to draw any definitive conclusions from the review. The findings do, however, highlight the importance of monitoring therapist skills in both research and clinical practice. Future research should aim to further examine this relationship, perhaps through experimental manipulation of therapist MI skills.

Empirical Study

Research has provided evidence for the efficacy and effectiveness of MI in improving viral load and reducing alcohol consumption in YP living with HIV (Murphy et al., 2012; Naar et al., 2009; Naar et al., under review). However, MI interventions are typically delivered by mental health professionals and as such, there is limited availability of MI for this

population. It has been argued that there is a need to increase access to such interventions for YP living with HIV to support sustained improvements in outcomes. Home-based delivery of such services has therefore been suggested (Gopalan et al., 2010; Snowden et al., 2006). As previously described, a recent RCT demonstrated the effectiveness of an MI intervention delivered by paraprofessionals without formal mental health training in both the home and clinic setting (Naar et al., under review). However, the quality of MI delivered by paraprofessionals and the relationship to outcomes for YP living with HIV has not been researched. Investigating the mechanisms of change for MI delivered by paraprofessionals is crucial to facilitate tailoring of MI training and interventions, and ultimately improve outcomes for YP living with HIV.

This study therefore conducted a secondary analysis of data from an RCT in which YP living with HIV were randomised to receive MI either in a clinic or home setting from paraprofessional MI therapists (Naar et al., under review). A subsample of participants with MITI coded MI sessions (n=65) were included to investigate whether: (1) paraprofessional MI skills, as measured by the MITI, are associated with outcomes (alcohol consumption and viral load) in YP living with HIV and, (2) group differences in outcomes for YP engaged in home versus clinic delivered MI were independent of therapist fidelity to MI. A multi-level modelling (MLM) analytic approach was used to account for the hierarchal, nested structure of the data (repeated outcome data for YP over four time points nested within participants).

The results found that, with the exception of the MI partnership skill, no MI skills were associated with outcomes for YP living with HIV. Tentatively, the results suggest that therapists demonstrating higher levels of MI partnership, a specific MI skill which promotes collaboration and power sharing in the dynamic, was associated with reduced alcohol consumption in YP. Results should be interpreted with caution due to multiple testing, thus

increasing the likelihood of Type I errors. Additional exploratory analysis revealed that MI skills are unlikely to explain the differences in outcomes across home and clinic delivered MI.

Overall, the findings suggest that paraprofessional MI skills were largely unrelated to outcomes for YP living with HIV. MI partnership skills, however, may be a particular therapist behaviour that is important for MI with this client group. This study was limited by its focus solely on therapist MI skills. MI sessions are an interaction between the therapist and client, and not accounting for client speech may partially explain the null findings. For example, there is reasonable evidence that client change talk mediates outcomes. Future research should seek to address the limitations of this study by incorporating fidelity measures of both therapist and client speech to clarify this relationship, in addition to measuring how these relate to one another within session via sequential analysis.

Integration, Impact and Dissemination

Integration

The overall aim of the thesis was to investigate the relationship between MI fidelity and outcomes for YP living with HIV. This was achieved through: (1) a systematic review of the MI fidelity literature across various health and behavioural outcomes for YP, and (2) an empirical study focused specifically on paraprofessionals' fidelity to MI in YP living with HIV. The review provided a comprehensive summary of the relationships between specific MI skills, as measured by MI fidelity measures, and outcomes for YP across various presentations such as diabetes, obesity and substance use. Interestingly, the review identified that no studies to date have analysed the relationship between therapist MI skills and outcomes for YP living with HIV. This provided a strong rationale for exploring this

relationship further in YP living with HIV, particularly when MI is delivered by paraprofessionals. The review also highlighted that process research of the relationship between MI therapist fidelity and outcomes for YP is in its infancy. Taken together, this provided a clear foundation for further exploration of the relationship between MI fidelity and outcomes for YP living with HIV. The systematic review also highlighted key areas for exploration in the empirical study. For example, consistent relationships between therapist demonstration of MI spirit and outcomes for YP were identified. These were considered in the context of the data analysis plan. The empirical study was therefore able to expand upon the review and provide novel findings for MI process research in the field of YP living with HIV.

Impact

YP aged 10-25 are the only age group in which there continues to be a rise in deaths as a result of HIV-related illnesses (UNICEF, 2017). Suboptimal ART adherence and alcohol consumption have been identified as key factors in poor treatment outcomes for YP living with HIV (Kerrigan et al., 2018). Research has demonstrated the efficacy of MI in improving outcomes for YP living with HIV (Murphy et al., 2012; Naar et al., 2009). More recently, delivery of MI by paraprofessionals has been investigated in both home and clinic settings to increase the network of MI providers and access for YP to such interventions (Naar et al., under review). However, it remains unclear as to how MI produces clinical benefit, particularly when delivered by paraprofessionals. This thesis investigated the relationship between therapist MI skills and a variety of outcomes for YP (systematic review) and specifically for YP living with HIV when MI is delivered by paraprofessionals (empirical study). This thesis contributes to the growing MI process research exploring the specific

mechanisms of MI which bring about behavioural change. The potential beneficiaries of this work include: (a) MI trainers and counsellors, (b) YP living with HIV, (c) health professionals working in HIV services, (d) researchers and (e) policy makers involved in generating guidelines for YP living with HIV.

Dissemination

The dissemination strategy includes academic publication, consultation with key stakeholders and use of online media platforms. Initially, a summary of the findings will be shared with the US team from which the data originated, which is anticipated to stimulate further discussions around dissemination and future research.

It is planned that both the systematic review and empirical study will be submitted for publication in a high-impact, international journal such as *AIDS & Behavior* or the *Journal of Adolescent Health*. This increases the dissemination of the findings across a variety of health professionals and researchers in these specific areas. Despite the largely non-significant findings of the empirical study, it remains important to disseminate these results to highlight the efficacy of MI when delivered by paraprofessionals, and to guide and prompt further research into the mechanisms relating to the efficacy of MI.

A summary of the key findings will also be shared with the therapists and supervisors who took part in the original RCT. The summary will be tailored to the clinicians and include highlights from the systematic review which may also be relevant more broadly to their clinical work with YP. This provides an opportunity for the research findings to directly influence the clinical practice of the therapists in the HIV clinics.

Finally, plans to make the research more broadly available to a wider audience include approaching organisations and online platforms with a summary of the research

findings. Potential organisations and online platforms identified include: (a) The Children's HIV Association (CHIVA), (b) AidsMap and (c) The Motivational Interviewing Network of Trainers (MINT). Plans for evidencing the impact of dissemination includes an online survey requesting feedback from beneficiaries on the provided information. A bespoke survey will be created to accompany the dissemination of the study findings to the clinicians of the original RCT, focusing specifically on whether teams have continued to incorporate MI within their service, and if this has had an impact on outcomes.

**Exploring the Relationship Between Therapist Motivational Interviewing Skills and
Outcomes for Young People: A Systematic Review**

Abstract

Motivational Interviewing (MI) has been established as an efficacious approach to facilitating behaviour change in young people (YP). Research has now shifted towards identifying the mechanisms through which MI produces clinical benefit. Evidence from the adult literature suggests specific MI therapist skills are related to outcomes. However, this relationship remains unclear in YP. This review investigated the relationship between MI skills and outcomes for YP across a variety of target behaviours. Studies were included if they statistically assessed the relationship between MI skills (measured by an MI fidelity assessment tool) and outcomes for YP aged 12-25 following an MI intervention. Eighteen studies (across 15 articles) met criteria for inclusion. The majority of included studies were from the United States and focused on substance use in YP. A narrative synthesis of the data was completed, including discussion and evaluation of the key relationships identified. Of the 18 eligible studies, 14 identified a relationship between therapist MI skills and outcomes for YP, with varying directions of relationships. Overall, the findings suggest that: (1) greater levels of MI spirit are related to improved outcomes for YP, (2) greater levels of MI non-adherent behaviours are related to poorer outcomes and (3) there is no relationship between MI-adherent behaviours and outcomes for YP. Findings also highlighted different relationships between MI skills and outcomes than those identified in the adult literature. Such MI skills may be important to consider for tailored MI approaches for YP. Future research should aim to further examine the relationship between MI skills and outcomes for YP through experimental manipulation of therapist MI skills.

Introduction

Motivational Interviewing (MI) has been established as an effective approach for eliciting behaviour change and improved health outcomes in adults and young people (YP) aged 12-25 (Schaefer & Kavookjian, 2017; VanBuskirk & Wetherell, 2014). As such, the focus of research has shifted towards understanding the mechanisms through which MI produces clinical benefit. One suggested pathway is that therapists' fidelity to MI, or how adherent they are to implementing MI skills such as complex reflections, impacts client outcomes (Miller & Rose, 2009). Indeed, this relationship has been demonstrated in adult populations across various MI skills (Apodaca & Longabaugh, 2009; Copeland et al., 2015). However, it remains unclear as to whether there is a relationship between specific MI skills and outcomes in YP. Clarifying this relationship will enable more targeted training of MI therapists, and ultimately more applicable and effective delivery of MI with YP.

Motivational Interviewing

MI originated as an approach in the area of addictions and problem drinking (Miller, 1983). With its focus on preparing individuals for behaviour change, it has broadened in application to a variety of health behaviour areas including smoking cessation, weight management, adherence to treatment and increasing physical exercise (Emmons & Rollnick, 2001). More recently, MI has shown effectiveness in chronic conditions requiring significant self-management demands, such as diabetes and asthma (Knight et al., 2006).

The efficacy of MI has been proposed to include both relational (i.e. the overall therapeutic atmosphere) and technical components (i.e. specific therapist MI skills), through which a containing and exploratory space is created for clients to identify reasons for behaviour change (Magill et al., 2014; Miller & Rose, 2009). MI therapists work

collaboratively with the client to identify and resolve ambivalence which may be obstructing behaviour change (Naar & Suarez, 2011). In session, therapists focus on and elicit the client's language indicating desires, ability, reasons, needs and commitment to change ('change talk'), whilst also aiming to decrease client statements away from change ('sustain talk') (Miller & Rollnick, 2013). Change talk is identified and explored by MI therapists to "strengthen personal motivation and commitment towards behaviour change" (Miller & Rollnick, 2013 p.12). MI is delivered in accordance with the 'spirit of MI', a humanistic way of being with the client (Miller & Rollnick, 2009). This therapeutic style promotes a collaborative partnership between the therapist and client, which is empathic, compassionate and autonomy granting (Miller & Rollnick, 2002; Naar & Suarez, 2011).

Therapists are trained to use specific MI skills to support the client in moving towards commitment to change. MI experts have cited such skills as crucial in evoking behaviour change (Rollnick, 2001). For example, therapists are trained to avoid MI non-adherent behaviours such as confronting clients or giving advice without permission, as these have been associated with reduced client change talk (Magill et al., 2014). Other skills include the use of open-ended questions, affirming a client's expression which acknowledges their strengths or efforts and reflective listening. Such skills can be used as a marker of therapist fidelity to MI and are described in more detail in the following sections.

MI with Young People

MI has been implemented across a diverse range of presentations in YP. It has been noted as a particularly fitting approach with YP due to the promotion of autonomy and focus on avoiding confrontation and argumentation (Tevyaw & Monti, 2004). By refraining from a 'lecture style' approach, therapists are able to develop effective therapeutic

relationships with YP, increasing the opportunity for positive outcomes. It is also a brief intervention that is developmentally consistent with the desires of YP for autonomy (Naar & Suarez, 2011), thus increasing its accessibility to this population. Indeed, MI has been associated with improved adherence to medication and treatment regimens in asthma (Riekert et al., 2011), diabetes (Wang et al., 2010) and HIV (Kennard et al., 2014) in YP. Evidence is also emerging to support the efficacy of MI in reducing HIV viral load (Naar et al., 2009) and substance use in YP (Jensen et al., 2011).

It has been argued that the delivery of MI with YP should take into account the unique developmental context, challenges and opportunities of this age group (Naar & Suarez, 2011). Adolescence through to emerging adulthood are transitional periods marked by biological, psychological, cognitive and social changes (Feldmen & Elliott, 1990). It is a time of identity exploration and role formation (Arnett, 2014; Rice & Dolgin, 2005), during which risk behaviours such as substance use and unprotected sexual acts peak (Galvan et al., 2007). It is also a critical period during which lifelong health behaviours are developed and consolidated (Holmbeck, 2002), therefore lending itself to approaches which focus on behaviour change, such as MI. The development of cognitive processes such as reasoning and formal thinking patterns (Piaget, 1972) which typically begin during early adolescence (ages 11-12), can impact on YP's motivations, goals and decision making (Naar & Suarez, 2011). As such, YP at the beginning of this developmental stage are likely to benefit from focusing on short-term concrete changes. Conversely, YP more advanced in developmental stage (approximately ages 16-17), will benefit from focusing on longer-term goals (Naar & Suarez, 2011). This tentatively suggests that the use of specific MI skills when engaging with YP may differ from those which have been found to be related to outcomes in adults. However, this remains unclear in YP (Magill et al., 2018). As such, there has been a shift

towards MI process research to investigate “what happens in therapy sessions and how these interactions influence outcomes” (McLeod et al., 2013, p. 142).

MI Skills and Fidelity

Fidelity refers to the competence and ability of a clinician to implement specific skills or techniques validly and reliably (Bellg et al., 2004; Kohrt et al., 2015). Indeed, MI therapist fidelity has been shown to account for variability in the effectiveness of MI in adults (Magill et al., 2018). Miller and Rose (2009) propose a ‘technical hypothesis’ for the efficacy of MI, in which behaviour change occurs either directly as a result of proficient MI therapist skills or indirectly through increased client change talk, and decreasing client sustain talk. Assessment of fidelity is particularly important when MI is delivered by paraprofessionals without formal mental health training, to ensure adequate and appropriate MI is being implemented (Magill et al., 2018). The use of paraprofessionals delivering MI is becoming increasingly common due to the limited availability of trained mental health professionals globally (Keeley et al., 2018; Miller et al., 2004), particularly those working with YP (Naar et al., 2009).

The development of fidelity measures has enabled assessment of therapists’ competence in using MI skills (Madson & Campbell, 2006). It has also allowed research to examine whether specific MI skills are associated with improved client outcomes, thus directly testing the technical hypothesis of the efficacy of MI (Miller & Rose, 2009). The Motivational Interviewing Treatment Integrity code (MITI; Moyers et al., 2016) is the most commonly used fidelity assessment tool in research and clinical settings (Gill et al., 2020). The MITI was developed as a simplified version of the Motivational Interviewing Skill Code (MISC: Houck et al., 2010) and is currently in its fourth version. The MITI is considerably

quicker and more efficient to use in comparison to the MISC. Whilst the MISC requires coding of an entire MI session and both client and therapist behaviours, the MITI focuses on coding only therapist behaviours from a 20 minute segment (Gill et al., 2020). However, a significant proportion of MI research trials continue to omit measures of treatment fidelity, thus reducing the ability to confidently attribute client outcomes to MI interventions (Jelsma et al., 2015).

MI fidelity measures are completed by a trained expert coding an audio recorded MI session. Although there is variation between measures in the specific coding of MI skills, each measure broadly generates two component scores: global scores and behaviour counts. Global scores capture the rater's overall impression of the MI intervention in key areas such as empathy and MI spirit using a Likert-scale from one (no evidence of skill) to five (competent evidence of skill). Behaviour counts, on the other hand, are tallied frequencies of specific therapist MI behaviours and have been found to have greater inter-rater reliability than global scores (Moyers et al., 2005b; Pierson et al., 2007; Woodin et al., 2012). A brief description of the key global scores and behaviour counts found across the studies included in the current review is presented in Table 1.

Behaviour counts can also be converted into ratio summary scores which control for time and enables comparisons to be made across different fidelity measures (e.g. MITI and MISC) (see Table 2 for descriptions). Summary scores can also be used to determine the levels of competence and proficiency of therapists, based on thresholds identified in the MITI manual (Moyers et al., 2014). Such scores are also frequently examined in the literature in terms of their relationship with behavioural outcomes.

Table 1*MI Skills from MI Fidelity Measures Identified in the Review*

MI skill	Description of skill
Global scores	
MI spirit	Therapist demonstrates evidence of collaboration, evoking the client's ideas about change and promoting autonomy.
Empathy	Therapist demonstrates an understanding of the client's perspective in relation to their thoughts, feelings and experiences.
Acceptance	Therapist demonstrates and communicates unconditional positive regard and respect towards the client.
Behaviour counts	
MI-adherent	Therapist demonstrates specific behaviours and skills that are consistent with an MI approach, including: asking permission before giving advice, affirming the client, emphasising the client's control and supporting the client.
MI non-adherent	Therapist demonstrates specific behaviours and skills that are inconsistent with an MI approach, including: advising without permission, persuading, confronting or directing the client.
Reflections	Therapist demonstrates reflective listening statements to convey understanding (simple reflection) or re-phrases to convey a deeper understanding (complex reflection).
Questions	Therapist asks questions that are either closed or open. Closed questions may support fact-finding, whilst open questions encourage the client to share their perspective and self-exploration.

Table 2*Summary Ratio Scores from MI Fidelity Measures Identified in the Review*

Summary ratio score	Description
Percent complex reflections	Number of complex reflections divided by the total number of reflections.
Percent open questions	Number of open questions divided by the total number of open and closed questions.
Reflection-to-question ratio	Total number of simple and complex reflections divided by the total number of open and closed questions.
Percent MI-adherent	Total number of MI-adherent counts divided by the total number of MI-adherent plus MI non-adherent counts.

MI Skills and Outcomes

Research has demonstrated an association between MI skills and outcomes in adults, providing support for the technical hypothesis of MI. A review by Apodaca and Longabaugh (2009) identified that therapist MI non-adherent behaviours (e.g. confronting and directing clients) were consistently related to worse outcomes across a number of substance abuse studies. This has been supported by evidence from further systematic reviews and meta-analyses (Magill et al., 2014; Magill et al., 2018; Romano & Peters, 2016). Copeland et al. (2015) examined the mechanisms of change in MI specifically in health behaviour studies and found consistent evidence for a relationship between MI spirit and outcomes for adults. Taken together, the findings suggest that key MI skills captured by MI

fidelity measures are associated with client behaviour outcomes. However, this relationship remains unclear in YP populations.

Aims of Review

Fidelity to MI and specific MI skills have been shown to be predictive of outcomes in adult populations over the age of 25. However, the literature lacks a clear overview of whether MI fidelity is related to outcomes for YP aged 12-25. Due to the developmental differences and priorities in this population, it is possible that a different relationship exists between MI skills and behavioural outcomes than that identified in adults. Clarifying this relationship will contribute to the existing MI process literature to ensure appropriate and tailored MI training and delivery of MI interventions to YP. The objective of the review was therefore to critically analyse and synthesise data on the relationship between MI fidelity and outcomes for YP. The following research question is addressed:

- i) Is there a relationship between therapist MI skills and outcomes for YP aged 12-25?

Method

A protocol was developed prior to commencing searches for the review which contained specific guidelines for identifying and screening articles, as detailed below. This was important to reduce bias in the review process; particularly as additional reviewers were involved in the process.

Eligibility Criteria

Participants

Studies involving YP aged 12-25 years were considered for inclusion. This age range was chosen based on the age categorisation of adolescence and emerging adulthood in the literature (Hagell & Shah, 2019).

Independent Variable

All studies were required to have a measure of MI fidelity to enable exploration of the relationship between MI skills and outcomes in YP. The fidelity search terms were chosen based on a recent systematic review of measures used to assess health professionals' competence in MI (Gill et al., 2020).

Outcome Variable

All included studies were required to have a post-intervention outcome measure for YP. Studies were included if an outcome measure related to the focus of the MI intervention was used (e.g. alcohol consumption). Psychological outcomes (e.g. mental health and wellbeing) that were not the focus of the MI intervention were also included if a specific outcome measure was used.

Study Designs and Methodologies

Empirical studies of a quantitative design (i.e. prospective/retrospective cohort/longitudinal, case-control and controlled or uncontrolled intervention) were included. Studies of a qualitative design were excluded. There were no restrictions placed on the publication dates or location of the studies. Studies were considered for the review if they were written in the English language only.

Sources of Information

Two electronic databases which capture publications from both medical and psychological areas were used to identify relevant studies for review; PubMed and PsycINFO. An additional search for grey literature was completed via ProQuest for unpublished dissertations, and through conference proceeding websites relating to the population of interest for the empirical study (e.g. AIDS2018, AIDS Impact). A hand search of the reference lists of identified papers was also undertaken. This combination of search methods allowed for a reasonably comprehensive list of potential articles related to the research question.

Search Strategy

Identified search terms were used across all databases as key words within either the abstract or title (Table 3). Including a search of key words within the abstract and title at this stage increased the chances that fidelity data were likely to be reported in the full text article.

Table 3*Search Terms*

Motivational Interviewing	Fidelity	Young
Motivational Interviewing	Fidelity	Young
Motivational Enhancement Therapy	Competence	Boys
Behaviour Change Counselling	Skills	Girls
	MI adherent	Teen*
	Motivational Interviewing Treatment	Child*
	Integrity	
	Motivational Interviewing Skill Code	Adolescen*
	Behaviour Change Counselling Scale	Youth
	Behaviour Change Counselling Index	
	Global Rating of Motivational Interviewing	
	Therapist	
	Independent Tape Rater Scale	
	Motivational Interviewing Assessment Scale	
	Motivational Interviewing Process Code	
	Motivational Interviewing Supervision and	
	Training Scale	
	Yale Adherence and Competence Scale	
	OnePass	
	SCOPE	

*Denotes truncation search term

Data Collection

The collection of data followed the practice guidelines of the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA: Moher et al., 2009). The initial searches were completed on the 18th December 2019. The following steps were completed:

1. The author carried out a search for the initial identification of studies, using the previously described search criteria and databases.
2. All identified studies were imported into a reference management software.
3. The author removed all duplications between databases.
4. The titles and abstracts of the remaining studies were independently screened for eligibility by two reviewers (the author screened all titles and abstracts and two undergraduate psychology students reviewed 50% each as a combined second reviewer).
5. Articles that were judged to not meet the review criteria by either reviewer were eliminated.
6. Articles considered relevant by either of the reviewers were retrieved in full text by the author.
7. The author assessed the eligibility of all the retrieved articles, whilst the second reviewers independently assessed half of the articles each. Exclusions were recorded in separate excel spreadsheets, with reasons noted.
8. Eligibility disagreements were resolved by a third reviewer (the academic supervisor).

Data Abstraction

The following information was extracted from each study identified as eligible for review:

- Study information: Authors, publication year, location, study design and sample characteristics for both YP and MI therapists.
- Measures: Measure used for assessment of MI fidelity and outcomes for YP.
- Key findings: Association between MI skills and outcomes for YP and the associated statistic.

Quality Assessment

The Mixed Methods Appraisal Tool (MMAT: Pluye et al., 2011) was used to assess the methodological quality of all eligible studies. This tool was chosen as it enables appraisal of a variety of study designs such as RCTs, non-randomised studies and quantitative descriptive studies. The author conducted a quality assessment on all eligible studies. A second reviewer (a Trainee Clinical Psychologist) independently carried out quality appraisal on 20% of the eligible studies. A third reviewer (the academic supervisor) resolved any disagreements.

Data Synthesis

The inter-rater reliability for study eligibility was assessed across the reviewers using Cohen's Kappa. As the second reviewers assessed 50% of the articles each, inter-rater reliability was calculated for both reviewers. As eligible studies significantly varied in terms of the examined variables and methods of reporting, a meta-analysis was not feasible. Therefore, a narrative synthesis of the data from included studies was undertaken.

Results

Study Selection and Characteristics

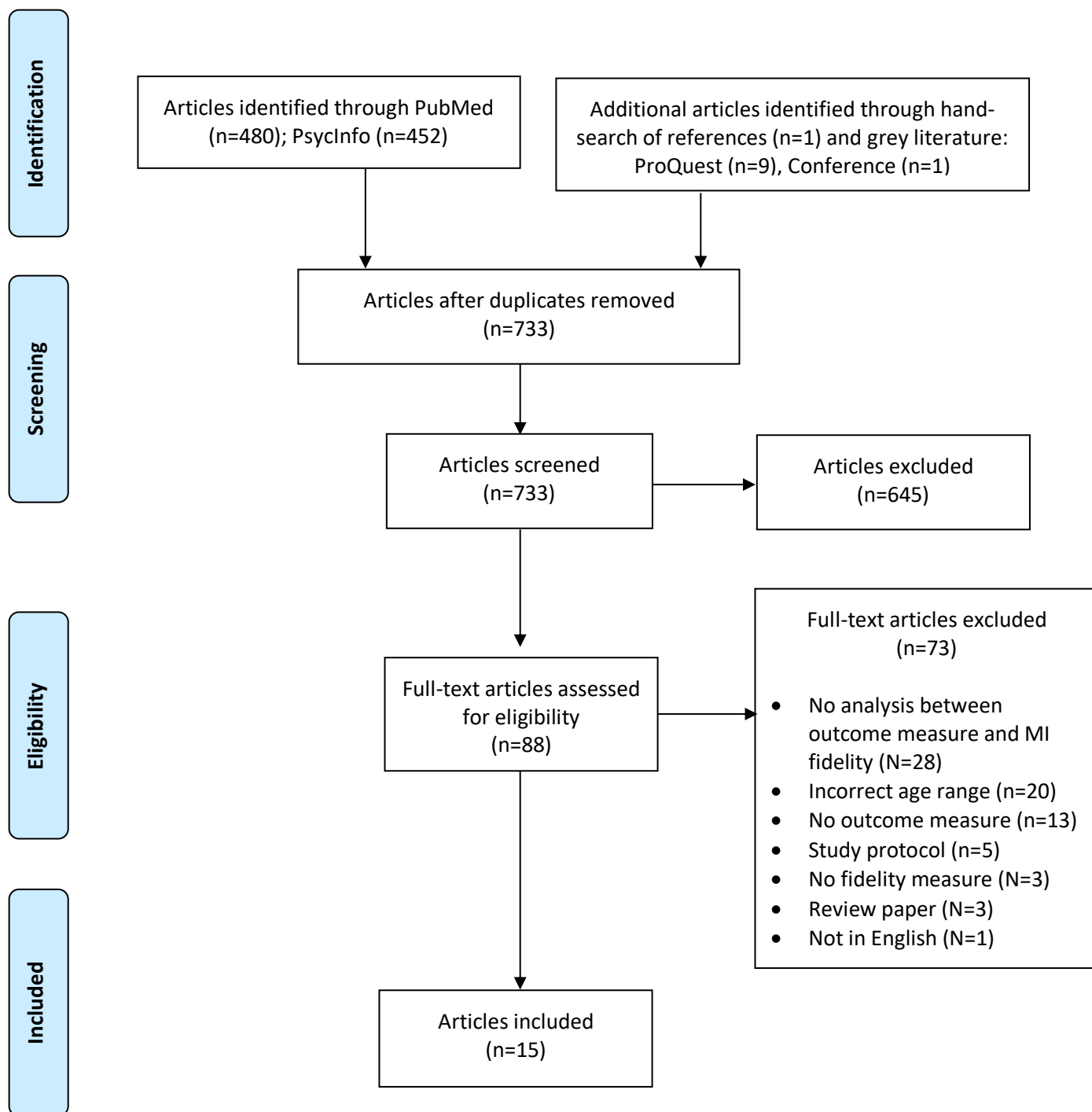
Following the initial search and removal of duplicates, a total of 733 articles were screened for inclusion by the author (see Figure 1). The second reviewers each screened 50% of the articles. A total of 88 full-text articles were assessed for eligibility by the author, with the second reviewers each screening 50% of the full-text articles. In total, 15 articles (18 studies) were deemed eligible and were included in the review. There was substantial agreement between the author and the second reviewer for study eligibility on the first 50% of papers (Cohen's Kappa=0.70). Substantial agreement was also found between the author and additional second reviewer for study eligibility of the second 50% of papers (Cohen's Kappa=0.76).

The characteristics of each study was extracted and is summarised in Table 6. The 15 reviewed articles were published between 2007 and 2019. Two articles presented secondary analysis of the same data sets from previous RCTs (Borsari et al., 2015; Borsari et al., 2019). Both articles were included in the review as the original paper (Borsari et al., 2015) completed secondary data analysis on the studies separately, whilst Borsari et al. (2019) pooled both data sets from the two studies together to increase statistical power. Furthermore, Borsari et al. (2015) included additional MI therapist skills (acceptance, empathy and MI spirit) which were not examined in the more recent study and therefore contributed additional data to the review. A further article conducted secondary analysis of two RCTs (Bertholet et al., 2014). Two unpublished theses were identified through a search of the grey literature (Antony, 2016; Engle, 2007). The majority of the studies were conducted in the US (n=13). Three studies took place in Switzerland, one in the United Kingdom and one in Australia. Four studies were RCT designs, with participants randomised

to receive either MI or treatment as usual (n=2), MI or assessment only (n=1) or MI with enhanced supervision or normal supervision (n=1). Six articles were secondary analyses of data from longitudinal RCTs, one of which reported on a group MI intervention (Engle, 2007). Two studies were longitudinal observational cohort designs (Caccavale et al., 2019; Pollak et al., 2009). One study was an uncontrolled intervention design (Antony, 2016).

Figure 1

PRISMA Study Search Process



Quality Assessment

The methodological quality of the eligible articles was assessed using the Mixed Methods Assessment Tool (MMAT; Pluye et al., 2011). As all included studies were of a quantitative design, the quantitative primary study component of the MMAT was used. An additional question was included to assess whether confounders were accounted for in the design or analysis. The quantitative component of the MMAT includes three quantitative designs: (i) quantitative RCTs; (ii) quantitative non-randomised and (iii) quantitative descriptive. Each design has its own specific methodological quality criteria on which the quality assessment is undertaken. Each criterion is answered with a 'yes', 'no' or 'can't tell' response. The author scored the quality of all included studies, whilst a second reviewer (a Trainee Clinical Psychologist) independently scored the quality of 20% of included studies (n=3). There was substantial agreement between the raters (Cohen's Kappa=0.80). No study was excluded as a result of its methodological quality owing to the comprehensive purpose of this review.

All studies passed the screening questions to be assessed using the MMAT. All studies included in this review were analytical in nature and were therefore quality assessed using either the non-randomised quantitative or quantitative RCT criteria accordingly.

Non-randomised Quantitative Designs

Eleven articles were assessed using the quantitative non-randomised criteria of the MMAT (Table 4). The majority of these studies used convenience sampling techniques, thus reducing the overall representativeness of the sample. A large proportion of the studies were secondary analyses of previous RCTs and therefore included analysis of data that was not collected for the purposes of the research questions. Four articles were noted to have

below 50% of the original MI sessions audio-recorded and coded, thus introducing further potential selection bias. All but one of the articles used reliable and valid measures of MI fidelity (Norberg et al., 2014). However, a number of articles did not report the validity or reliability of outcome measures for YP. Approximately half of the included articles accounted for confounders in the design and analysis (e.g. age, gender), with the remaining either not accounting for them (n=2) or it being unclear (n=4). Retention rates varied across the studies, ranging from 60%, with the majority having over 80%. One study did not report a retention rate figure (Tollison et al., 2013). A further study had an initial 33% response rate, but a 100% follow-up rate. A proportion of studies indicated that the baseline outcome measure was controlled for in the analysis, thus reducing the potential confound of baseline levels (n=8).

Quantitative RCT Design

Four articles were assessed using the quantitative RCT criteria of the MMAT (Table 5). Only two studies clearly described the randomisation procedures (Mastroleo et al., 2014; Norberg et al., 2014). Only one study provided a clear description of the allocation concealment (Norberg et al., 2014). The majority of studies did not have complete outcome data of over 80% and only two studies had below 20% attrition rates (Gaume et al., 2014, Norberg et al., 2014). Two studies were noted to be of particularly low quality (Logan et al., 2014; Mastroleo et al., 2013). All studies controlled for the baseline outcome measure in the analysis.

Table 4*Quality Assessment for Quantitative Non-Randomised Studies*

MMAT Item	Quantitative non-randomised studies			
Reference	Participants recruited to minimise selection bias?	Appropriate measurements regarding intervention outcomes?	Complete outcome data (>80%), acceptable response rate (>60%) or acceptable follow-up rate (cohort)?	Are confounders accounted for in the design and analysis?
Antony (2016)	✓	✓	✓	✓
Bertholet et al. (2014)*	✓	✓	✓	✓
Borsari et al. (2015) ‡*	✓	✓	✓	✓
Borsari et al. (2019) ‡*	✓	✓	✓	✓
Caccavale et al. (2018)	✓	✓	✓	✓
Engle (2007)	✓	✓	✓	?
Ewing et al. (2015)	✓	✓	✓	?
McCambridge et al. (2011)	✓	✓	✓	✓
Pollak et al. (2009)	✓	✓	✗	✗
Tollison et al. (2013)	✓	✓	✗	?
Walton et al. (2017)	✓	✓	✓	✗

‡ Denotes articles which used the same datasets

* Denotes articles including more than one study

? Denotes 'cannot tell' rating

Table 5*Quality Assessment for Quantitative RCTs*

MMAT Item	Quantitative RCTs			
Reference	Clear description of randomisation?	Clear description of allocation concealment/blinding?	Complete outcome data (>80%?)	Low withdrawal/drop out (<20%)?
Gaume et al. (2014)	✘	✘	✓	✓
Logan et al. (2014)	✘	✘	✘	✘
Mastroleo et al. (2013)	✓	✘	✘	✘
Norberg et al. (2014)	✓	✓	✘	✓

MI Intervention

As per the inclusion criteria, all articles included an MI intervention. The majority of articles included MI interventions ranging from one to two sessions (n=14). One article included a school-based MI group spanning eight to ten sessions (Engle, 2007). All articles measured immediate post-intervention outcomes. Fourteen articles included between one to three follow-up points post-intervention, with the majority including at least two follow-ups (n=8). The post-intervention follow-up time points ranged from one to 12 months across the studies.

A total of eight studies reported the overall impact of the MI intervention on YP outcomes. Of this, four reported significant improvements in YP outcomes as a result of the MI intervention (Bertholet et al., 2014; Borsari et al., 2015: study 1; Gaume et al., 2014; Logan et al., 2015). Borsari et al. (2015: study 2) found a reduction in YP's alcohol related problems following MI but no difference in alcohol consumption in comparison to the control group. One study reported no significant changes in alcohol or drug use outcomes following MI (Borsari et al., 2015: study 1). A further study found both the MI and education control group demonstrated reductions in ecstasy use, but there was no significant difference at follow-up between the groups (Norberg et al., 2014). One study found no significant differences in outcomes as a result of MI therapists' receiving enhanced supervision in comparison to standard supervision (Mastroleo et al., 2014).

Table 6*Summary of Extracted Data From Eligible Studies*

Reference	Study context	Design and sampling strategy	Sample characteristics	YP outcome measure	MI fidelity measure	Association between YP outcome and MI fidelity
Antony (2016)*	USA Mental health clinics Comorbid substance use and mental health diagnosis	Cohort (uncontrolled) Convenience sampling	<i>YP sample:</i> N= 32 (90.6% female). Mean age 16.88 years. White/Caucasian (78.1%), Latin American (6.3%), other (15.6%). <i>MI therapist sample:</i> N= 4 (2 social workers, 2 psychiatrists). Age, gender and ethnicity not reported. Range of clinical experience from 5-10 years. Trained in MI for study.	Number of DBT sessions attended.	MITI 3.1.1	Participants in the high percent MI-adherent therapist group attended significantly more DBT sessions (M=9.36, SD = 0.92), $t(21)=-3.19$, $p=0.01$) compared to the low percent MI-adherent group (M=5.17, SD=4.45). No differences in treatment attendance with MI therapists scoring high or low on percent complex reflections, percent open questions, and question-to-reflection ratio.

Bertholet et al. (2014)	Switzerland	Secondary analysis of data from two RCTs	<i>YP sample:</i> Study 1: N=62 (100% male). Mean age 19.2 years. Ethnicity not reported.	Alcohol consumption (self-reported number of alcoholic drinks consumed per day).	MISC 2.1.	Study 1: In over-dispersed Poisson regression models, MI spirit was associated with significantly more drinking at 3 month follow-up (Estimate=0.32, SE=0.15, p=0.03).
<i>Study 1:</i> <i>Gaume et al.</i> (2011)	Army recruitment centre	Convenience sampling				
<i>Study 2:</i> <i>Daepfen et al.</i> (2011)	Heavy episodic drinking; age 20		Study 2: N=128 (100% male). Mean age 19.6 years. Ethnicity not reported.			Study 2: In over-dispersed Poisson regression models, MI spirit was associated with significantly less drinking at 3 month follow-up (Estimate=-0.15, SE=0.07, p=0.03).
			MI therapist sample not reported.			No association between global ratings of empathy or acceptance with drinking at 3 month follow-up.

Borsari et al. (2015)	USA	Secondary analysis of data from two RCTs	<i>YP sample:</i> Study 1: N=91 (53.9% male). Mean age 19.15 (SD=0.70). White (93.4%), Non-white (6.6%).	Alcohol consumption (<i>Alcohol and Drug Use Measure</i>); estimated peak and typical blood alcohol concentration (tBAC); <i>Rutgers Alcohol Problems Index [RAPI]</i> .	MISC 2.0.	Study 1: Significant positive correlation between MI-consistent behaviours and alcohol-related problems at 6m follow-up ($r(63)=0.27$, $p<0.05$) and between MI-inconsistent behaviours and alcohol-related problems at 6m follow-up ($r(63)=0.26$, $p<0.05$). Significant negative correlation between global ratings of acceptance and drinks per week ($r(63)=-0.33$, $p<0.01$), empathy and drinks per week ($r(63)=-0.30$, $p<0.05$) and MI spirit and drinks per week ($r(63)=-0.28$, $p<0.05$).
<i>Study 1: Carey et al. (2009)</i>	Universities	Convenience sampling				
<i>Study 2: Borsari et al. (2012)</i>	Students violating campus alcohol policy, age 18+		Study 2: N=158 (66.46% male). Mean age 18.64 (SD=0.82). White (98.73%), Non-white (1.27%).			
			<i>MI therapist sample:</i> Study 1: N=3 (100% female). Bachelor's level educated. Mean age=22. 100% non-Hispanic White. No previous MI training.			Study 2: Significant negative association between global

			<p>Study 2: N=11 (82% female). PhD students and postdoctoral research fellows. Mean age=25. Ethnicity not reported. Previously trained in MI (n=7).</p>			<p>ratings of acceptance and drinks per week ($r(141)=-0.18$, $p<0.05$) and between global ratings of MI spirit and drinks per week ($r(141)=-0.18$, $p<0.05$). Global ratings of empathy were positively associated with tBAC ($r(141)=0.19$, $p<0.05$).</p>
<p>Borsari et al. (2019)</p> <p><i>Study 1: Carey et al. (2009)</i></p> <p><i>Study 2: Borsari et al. (2012)</i></p>	<p>USA</p> <p>Universities</p> <p>Students violating campus alcohol policy; age 18+</p>	<p>Secondary analysis of data from two RCTs</p> <p>Convenience sampling</p>	<p><i>YP sample (study 1 & 2):</i> N=228 (59.2% male). Mean age 18.8 years (SD=0.78). White (96.5%), Non-white (3.5%).</p> <p><i>MI therapist sample:</i></p> <p>Study 1: N=3 (100% female). Bachelor's level educated. Mean age=22.</p>	<p>Alcohol consumption (Adaptation of <i>Alcohol and Drug Use Measure</i>; tBAC and RAPI).</p>	<p>MISC 2.0.</p>	<p>MI-consistent behaviours did not significantly predict change in weekly drinks ($p=0.48$) or tBAC ($p=0.17$) in either study.</p>

			100% non-Hispanic White. No previous MI training.			
			Study 2: N=11 (82% female). PhD students and postdoctoral research fellows. Mean age=25. Ethnicity not reported. N=7 previously trained in MI.			
Caccavale et al. (2019)	USA	Longitudinal, observational cohort	<i>YP sample:</i> N=55 (50.9% male). Mean age 14.8 years (SD=1.6). Caucasian/White (76.4%); African American/Black (16.4%); Asian (1.8%).	Medication adherence and blood-glucose levels (<i>Diabetes Behaviour Rating Scale [DBRS]; Self-Efficacy for Diabetes Self-Management</i>)	MITI 4.1.	MI non-adherent behaviours were associated with: (a) poorer HbA1c at 3 months ($\beta=0.02$, $p=0.004$); (b) worse diabetes adherence at 1 month ($\beta=-0.30$, $p=0.02$); (c) lower patient self-efficacy

			<p><i>MI therapist sample: N=8</i> [SEDSM]; HbA1c (60% female). 5 physicians, 2 nurse practitioners. Mean age 42.8 years (SD=13). Caucasian/White (60%); Asian (40%). No previous MI training and no MI training for study.</p>			<p>for diabetes self-management at 1 month ($\beta=-0.41$, $p=0.004$).</p> <p>MI-adherent behaviours were not significantly associated with HbA1c, adherence or self-efficacy.</p>
Engle (2007)*	USA	Secondary analysis of data from experimental group of RCT	<p><i>YP sample: N=108</i> (55% male). Mean age 15 years. Non-Hispanic White (72%); Hispanic (15%), African-American (9%), other (5%).</p> <p><i>MI therapist sample: N=5</i> (60% male). Masters-level clinicians. Age and ethnicity not reported.</p>	<p>Substance use (<i>Drug Use Screening Inventory-Revised [DUSI-R]</i>).</p>	MITI 2.0.	<p>Association between group leader empathy & post-test marijuana use (Spearman's r) ($r(106)=-0.46$, $p=0.01$).</p> <p>Group leader use of number of complex reflections associated with 4-month alcohol consumption (Pearson's r) ($r(106)=-0.68$, $p=0.01$).</p>

			Previous experience not reported.			All other group leader MI skills (number of open questions, MI spirit) were not associated with improved YP outcomes.
Ewing et al. (2015)	USA	Secondary analysis of data from experimental group of RCT	<i>YP sample</i> : N=80 (65% male). Mean age 16 years. Hispanic (59%), non-Hispanic (41%). MI therapist sample not reported.	Substance use (<i>RAPI; Marijuana-Related Problems [MRP]; Timeline Follow-Back interview [TLFB]</i>).	MITI 3.1.1	Global ratings of MI spirit, autonomy support and number of complex reflections each predicted alcohol-related problems, with greater therapist skills predicting better adolescent outcomes. MI spirit (IRR=0.81, SE=0.08, z=-2.08, p=0.04) Autonomy support (IRR=0.72, SE=0.10, z=-2.41, p=0.02) Complex reflections (IRR=0.98, SE=0.01, z=-1.93, p=0.01)

Gaume et al. (2014)	Switzerland Army recruitment centre Male hazardous drinkers attending mandatory army conscription process	RCT Convenience sampling	<i>YP sample:</i> N=397 (100% male). Mean age 20 years. Ethnicity not reported. <i>MI therapist sample:</i> N=18 (55.6% female). 50% psychologist, 50% physicians. Age and ethnicity not reported. Range of MI experience from beginners to recognised experts. Training for MI provided for study.	Alcohol consumption (drinking composite score for (i) usual drinking days per week; (ii) usual drinks per drinking day and; (iii) frequency of binge drinking).	MISC version 2.1	YP with MI therapists high on MI global ratings ($t=-2.22$, $p=0.003$), demonstrating higher percentage of complex reflections ($t=-2.81$, $p=.01$) and no MI-inconsistent behaviours ($t=-3.24$, $p<0.001$) had better outcomes versus control group with no intervention. YP with MI therapists demonstrating higher ratings of MI-consistent behaviours ($t=-0.22$, $p=0.82$) did not differ in outcomes to control group.
Logan et al. (2015)	USA University	RCT Convenience sampling	<i>YP sample:</i> N=61 (57.4% male). Mean age 19.16 years. White (96.7%), other (3.3%).	Alcohol consumption (<i>Daily Drinking Questionnaire [DDQ]</i> ; estimated	MITI 3.0.	Number of closed questions, open questions, simple reflections & complex reflections were unrelated to drinking outcomes.

	Students sanctioned to clinical programme following violation of campus alcohol policy		<i>MI therapist sample:</i> N=4. Counselling and Clinical Psychology graduate students. Trained in MI for study. Age, gender and ethnicity not reported.	blood alcohol concentration).		
Mastroleo et al. (2014)	USA University Undergraduate students in violation of campus alcohol policy	RCT Convenience sampling	<i>YP sample:</i> N=82 (79.3% male). Mean age 19.4 (SD=1.3). White (90.2%); American Indian (3.7%), African American (2.4%), other (3.6%). <i>MI therapist sample:</i> N=12 (83.3% female). Peer counsellors were health and wellness educators. Age and	Alcohol consumption (<i>DDQ; Young Adult Alcohol Problems Screening Test [YAAPST]</i>).	MITI 3.0 & Peer Proficiency Assessment (PPA)	Regression results identified that a higher reflection-to-question ratio was related to poorer follow-up drinking outcomes on the YAAPST ($b=20.86, t=2.30, p=0.03$); and a significant relationship between MI spirit and heavy drinking at 3-month follow up ($b=1.38, t=2.27, p=0.03$).

			ethnicity not reported. No prior training or experience in MI.			<p>Collaboration and evocation were both significantly related to 6-week heavy drinking ($b=0.55$, $t=2.03$, $p=0.05$, and $b=0.57$, $t=1.97$, $p=0.05$ respectively).</p> <p>Collaboration and autonomy were significantly related to 3-month heavy drinking ($b=0.81$, $t=2.12$, $p=0.04$ and $b=1.77$, $t=2.51$, $p=0.02$).</p> <p>There was no relationship between empathy skills and any drinking outcomes.</p>
McCambridge et al. (2011)	UK College	Secondary data analysis of RCT	<i>YP sample</i> : N=75 (65% male). Mean age 18 years. Black (45%), White (11%), Asian (44%) or other.	Cannabis use (Self-reported cessation of cannabis use [yes/no]).	MITI 2.0.	MI spirit and the proportion of reflections that were complex were both predictive of cannabis cessation at three months follow-up (MI spirit

	At least weekly cannabis users, age 16-19	Convenience sampling	<i>MI therapist sample:</i> N=4 (1 psychology researcher; 3 psychology graduates). Age, gender, ethnicity not reported. MI experience not reported.	Biological marker of cannabis use (saliva sample).		logOR=0.5 [0.04-0.96], p=0.03; percent complex reflections logOR=3.9 [0.81-6.98], p=0.01). No other MI skills (empathy, reflections to questions ratio, percent open questions, percent MI-adherent) had any relationship with YP outcomes.
Norberg et al. (2014)	Australia University Ecstasy use on at least 3 occasions in past 90 days, age 16+	RCT Convenience sampling	<i>YP sample:</i> N= 66. Mean age 23.62. Gender and ethnicity not reported. <i>MI therapist sample:</i> N=7 (5 clinical psychologists; 2 trainee clinical psychologists). N=2 had over 10 years' experience of delivering	Ecstasy use (<i>TLFB</i>); <i>Severity of Dependence Scale [SDS]</i> ; <i>University of Rhode Island Change Assessment Scale [URICA]</i> .	MI section of Yale Adherence and Competence Scale (YACS-11: Nuro et al., 2005)	MI-adherent behaviours were not related to changes in ecstasy use at 24- week follow-up.

			substance use treatment. MI training delivered to rest of therapists. Gender, age and ethnicity not reported.			
Pollak et al. (2009)	USA Primary care clinic Adolescents age 12-18 with BMI >85 th percentile	Longitudinal, observational cohort Convenience sampling	<i>YP sample</i> : N=30 (63.3% female). Mean age 14.3 years (SD=1.6). Black (73.3%), White (26.7%). <i>MI therapist sample</i> : N=16. Primary care physicians. Age, gender and ethnicity not reported. No previous MI training. Not trained for study.	Physical activity (<i>Framingham Physical Activity Index [FPAI]</i>). Weight (Self-reported; actual). Screen time (hours and minutes of daily TV/computer time).	MITI (did not state version)	A positive relationship between MI-adherent behaviours and physical activity was found, with a medium effect size ($r=0.41$, $p=0.06$) and a negative relationship between physicians' MI Spirit and patients' reported weight ($r=-0.46$, $p=0.02$). When physicians used a greater number of complex reflections, a further negative

						relationship was found with patients' reported screen time ($r=-0.41$, $p=0.08$).
Tollison et al. (2013)	USA University First-year students who participated in high school athletics	Secondary data analysis of RCT Convenience sampling	<i>YP sample:</i> N=327. Gender, age and ethnicity not reported for proportion of sample used in current study with audio-tapes for MITI coding. <i>MI therapist sample:</i> N=21. Trained undergraduates or entry-level graduate students. All attained beginner proficiency in MI. Age, gender and ethnicity not reported.	Alcohol consumption (<i>DDQ</i> ; typical number of standard drinks consumed per week).	MITI 2.0.	A higher number of open questions was positively correlated with drinks per week at both 5-months ($r(325)=0.21$, $p<0.001$) and 10-months follow-up ($r(325)=0.26$, $p<0.001$). A higher number of simple reflections by the MI therapist was positively correlated with drinks per week at both 5-months ($r(325)=0.29$, $p<0.001$) and 10-months follow-up ($r(325)=0.30$, $p<.001$).

Walton et al. (2017)	USA	Secondary data analysis of RCT	<i>YP sample: N=277</i> (51.5% male). Mean age 18.6.	Alcohol consumption	MITI 3.0.	Global MI spirit and MI- adherent ratings were not significant predictors of alcohol consumption at follow- up.
	Emergency Department	Convenience sampling	White (79.4%); African American (9.5%), multiracial (6.1%), other (1.4%), Asian (0.6%).	<i>(Alcohol Use Disorders Identification Test-Consumption [AUDIT-C]).</i>		
	Positive screen for risky drinking, age 14-20		MI therapist sample not reported.			

*Denotes unpublished dissertation these

Participants

Young People

The sample sizes of YP across the articles ranged from 30 to 397 (Mean=129.80, SD=105.61). A total of 2,257 YP were included in the current review. As two articles used the same datasets for secondary analyses, duplicate participants are included in this count. The mean age of YP ranged from 14-24 years. The majority of the articles were heavily weighted by male dominant samples (n=13), apart from two articles in which the sample was largely female (Antony, 2016; Pollak et al., 2009). Two articles included studies which involved 100% male participants (Bertholet et al., 2014: study 1 and 2; Gaume et al., 2014). Two studies of secondary analyses reported the overall gender ratios of the original sample size but did not report the gender ratios of YP whose data was used for the MI fidelity analysis (Norberg et al., 2014; Tollison et al., 2013). The majority of studies included predominantly Caucasian participants (n=10).

MI Therapists

The sample sizes of MI therapists across the reviewed articles ranged from three to 21 (Mean=9.07, SD=5.94). Three articles did not report the number of MI therapists (Bertholet et al., 2014; Ewing et al., 2015; Walton et al., 2017). The professions and highest level of education of MI therapists greatly varied across the studies. Two studies used bachelor-level educated students. A further two studies used primary care physicians and nurses. An additional two studies used qualified and trainee counselling or clinical psychologists, whilst one study used a combination of psychologists and physicians. The remaining studies used social workers and psychiatrists, trainee under-graduates, peer health and wellness educators and a combination of PhD students and postdoctoral

research fellows. Four studies did not report the profession of the MI therapists (Bertholet et al., 2014; Borsari et al., 2019; Ewing et al., 2015; Walton et al., 2017). The years of clinical and specific MI experience greatly varied across the studies. Five studies included previously trained and experienced MI experts (Gaume et al., 2014; Borsari et al., 2015: study 2; Borsari et al., 2019: study 2; McCambridge et al., 2011; Norberg et al., 2014). Six studies included clinicians with a range of clinical experience, but no formal MI training prior to the study (Antony, 2016; Borsari et al., 2015: study 1; Borsari et al., 2019: study 1; Logan et al., 2015; Mastroleo et al., 2014; Tollison et al., 2013). Two studies involved primary care physicians with little to no formal MI training, and no training was provided for the study due to the observational design (Caccavale et al., 2019; Pollak et al., 2009).

The majority of studies did not report the age, gender or ethnicity of MI therapists. One article included two studies with reported mean ages of MI therapists ranging from 22 to 25 years of age (Borsari et al., 2015), whilst another reported a mean age of 42.8 (Caccavale et al., 2019). Four studies reported gender ratios of the MI therapists, three of which were predominantly female (Caccavale et al., 2019; Gaume et al., 2014; Mastroleo et al., 2014). One study reported a 100% White sample of MI therapists (Borsari et al., 2015), with another reporting 60% Caucasian/White sample (Caccavale et al., 2019).

Measures

MI Skills Measures

All studies included a measure of MI fidelity, as per the inclusion criteria. A variety of fidelity assessment tools were used across the studies. Ten articles used the MITI, ranging from versions 2.0 to 4.1. Two articles used the MISC 2.0 and two articles used the MISC 2.1.

One article used the MI section of the Yale Adherence and Competence Scale (YACS-11: Nuro et al., 2005).

Outcome Measures for Young People

As per the inclusion criteria, all studies included a minimum of a post-intervention outcome measure for YP. A variety of measures were included across the studies. A large proportion of studies used outcome measures relating to alcohol consumption (n=11) or non-alcoholic substances (e.g. cannabis use) (n=4). These measures included a mixture of self-report and biological markers of alcohol and substance use. The remaining studies used outcome measures of intervention engagement, medication adherence, blood glucose levels, physical activity and weight. In two of these studies, actual weight and blood glucose levels were also measured (Pollak et al., 2009; Caccavale et al., 2019).

Synthesis of Results

Due to the heterogeneity of the outcome measures used for both YP and MI therapist fidelity, it was not possible to conduct a meta-analysis of the data. A narrative synthesis of the data was therefore performed, with the main outcomes of each study described and evaluated.

Of the 18 eligible studies, four did not find any significant associations between therapist MI skills and outcomes for YP (Borsari et al., 2019: study 1 and 2; Logan et al., 2015; Norberg et al, 2014; Walton et al., 2017). The remaining 14 articles demonstrated significant associations between MI skills and outcomes, in both positive and negative directions. The key findings from these articles are described below.

Behaviour Counts and Summary Scores

MI-Adherent.

The MITI refers to 'MI-adherent' behaviours, whereas the MISC refers to 'MI-consistent' behaviours. As the majority of studies in this review used the MITI, the phrase 'MI-adherent' will be used throughout. A total of ten studies reported on the relationship between MI-adherent therapist behaviours and outcomes for YP. Of this, seven studies found that MI-adherent skills were not significantly associated with outcomes (Borsari et al., 2019: study 1 and 2; Caccavale et al., 2019; Gaume et al., 2014; McCambridge et al., 2011; Norberg et al., 2014; Walton et al., 2017). Two studies found that greater levels of MI-adherent behaviours were significantly associated with improved outcomes for YP (Antony, 2016; Pollak et al., 2009). Conversely, one study found that higher levels of MI-adherent behaviours were associated with greater levels of alcohol related problems at six month follow-up (Borsari et al., 2015: study 1).

MI Non-Adherent.

As previously described, the MITI refers to 'MI non-adherent behaviours' whilst the MISC refers to 'MI-inconsistent behaviours'. Again, the MITI term 'MI non-adherent' will be used throughout. Three studies analysed the relationship between MI non-adherent therapist behaviours on outcomes for YP. Two studies demonstrated that therapists exhibiting MI non-adherent behaviours had poorer outcomes for YP (Borsari et al., 2015: study 1; Caccavale et al., 2019). A further study found that therapists demonstrating no MI non-adherent behaviours had better outcomes (Gaume et al., 2014).

Simple and Complex Reflections.

Five studies reported on the relationship between therapist use of simple and complex reflections on outcomes for YP. Three studies found that a higher number of complex reflections made by the therapist was associated with improved outcomes for YP (Engle, 2007; Ewing et al., 2015; Pollak et al., 2009). One study found that more simple reflections were positively related to increases in drinking for YP at both five and ten month follow-up (Tollison et al., 2013). One study demonstrated that simple and complex reflections were unrelated to drinking outcomes in YP (Logan et al., 2015). However, this study was assessed to be of particularly low quality and this finding should therefore be interpreted with caution.

Percent Complex Reflections.

Three studies reported on the relationship between percent complex reflections demonstrated by MI therapists and outcomes for YP. Two of these studies found that higher levels of percent complex reflections by the therapist was associated with improved outcomes for YP (Gaume et al., 2014; McCambridge et al., 2011). One study found no significant differences in subsequent treatment engagement by YP if the MI therapist scored high or low on percent complex reflections (Antony, 2016).

Open and Closed Questions.

Three studies analysed the relationship between open and closed questions and outcomes for YP. Two studies found that the number of open questions was not associated with outcomes (Engle, 2007; Logan et al., 2015). Although Logan et al. (2015) demonstrated that MI therapist use of closed questions were unrelated to outcomes, this finding is limited

due to the low quality assessment rating on the MMAT. One study found that a higher number of open questions was related to increases in drinking in YP at five and ten months follow-up (Tollison et al., 2013).

Percent Open Questions.

Two studies explored the relationship between percent open questions and outcomes for YP. Both studies found no relationship between this behaviour count and outcomes (Antony, 2016; McCambridge et al., 2011).

Reflection-to-Question Ratio.

Three studies reported on the relationship between therapist scores on the reflection-to-question ratio and YP outcomes. Two studies found no relationship between this summary scores and outcomes (Antony, 2016; McCambridge et al., 2011). One study demonstrated that higher reflection-to-question ratios were significantly related to poorer outcomes (Mastroleo et al., 2014). However, again, this study was of moderately low quality and this finding should therefore be interpreted with caution.

Global Scores

A total of 13 studies reported results on the relationship between therapist global MITI scores and outcomes for YP. It is important to note that version 3.0 of the MITI parsed the global rating of 'MI Spirit' into three separate ratings (evocation, collaboration and autonomy/support). As such, the 'MI Spirit' section below will also describe the global scores for these skills. The global scores for empathy and acceptance are described separately. No studies reported on findings relating to the global scores for direction

(version 3.0 and 3.1.1 of the MITI) or cultivating change talk, softening sustain talk and partnership (version 4.1 of the MITI).

MI Spirit.

A total of 12 studies reported on the relationship between MI spirit and outcomes for YP. Seven studies found a relationship between greater levels of MI spirit and improved outcomes (Bertholet et al., 2014: study 2; Borsari et al., 2015: study 1 and 2, Ewing et al., 2015; Gaume et al., 2014; McCambridge et al., 2011; Pollak et al., 2009). Both Bertholet et al. (2014: study 1) and Mastroleo et al. (2014) found the reverse relationship, with greater levels of MI spirit associated with poor outcomes. However, the latter study should be cautiously interpreted due to the moderately low quality assessment. Two studies demonstrated no relationship between therapist MI spirit and outcomes (Engle, 2007; Walton et al., 2017).

Two studies reported on the relationship between the global scores of autonomy/support, evocation and collaboration on outcomes. One study found that higher therapist global scores on autonomy and evocation were associated with fewer alcohol-related problems and thus better outcomes for YP (Ewing et al., 2015). Although a further study found that global scores for collaboration, evocation and autonomy/support were significantly related to poorer outcomes at follow-up (Mastroleo et al., 2014), this study is limited by its moderately low quality assessment rating.

Empathy.

Five studies reported on the relationship between therapist global ratings of empathy and outcomes for YP. Two studies found that higher global ratings of empathy

were associated with improved outcomes (Borsari et al., 2015: study 1; Engle, 2007). Four studies found that global ratings of empathy were not significantly associated with any outcomes for YP (Bertholet et al., 2014: study 1 and 2; Mastroleo et al., 2014; McCambridge et al., 2011), although one study is limited by moderately low quality assessment (Mastroleo et al., 2014). One study found that higher global ratings of empathy were associated with poorer outcomes (Borsari et al., 2015: study 2).

Acceptance.

Three studies reported on the relationship between global scores of acceptance and outcomes. Two studies found a significant negative relationship between acceptance and drinks per week, suggesting higher global ratings of acceptance are associated with reduced number of drinks consumed per week (Borsari et al., 2015: study 1 and 2). One study found no association between therapist global ratings of acceptance and drinking at three month follow-up (Bertholet et al., 2014).

Discussion

This review aimed to examine and synthesise the literature on therapist MI skills and the relationship to a variety of outcomes for YP. A total of 15 articles (18 studies) were included. Of these, 14 studies provided evidence for a relationship between therapist MI skills and outcomes for YP. Overall, it appears that specific MI skills are related to outcomes for YP, thus providing some support for the technical hypothesis of the efficacy of MI (Miller & Rose, 2009). However, the directions of the relationships were inconsistent. The findings should be interpreted tentatively and with caution owing to both the heterogeneity of outcome and MI fidelity measures and the varied methodological quality of the included studies.

Key Findings

MI spirit appeared to be the most consistent therapist skill related to outcomes for YP. A total of eight studies supported the link between higher ratings of therapist global MI spirit and better outcomes for YP. This is supported by and builds on the evidence from a recent systematic review of the adult MI literature (Copeland et al., 2015). As previously described, MI spirit encapsulates elements of collaboration, evocation and autonomy. These skills appear to compliment some of the key developmental tasks in YP. The development of autonomy has been cited as a 'core element' of the transition from adolescence to adulthood (Rice & Dolgin, 2008). YP strive for independence and increased responsibility on both an emotional and behavioural level (Olsen & Sutton, 1998). In doing so, conflict can increase between YP and their primary caregivers as the desire for independence is at odds with the need for ongoing parental supervision (Hadiwijaya et al., 2017). The spirit of MI promotes both autonomy in decision making and evoking the YP's ideas around change,

thus instilling a sense of responsibility and independence. This is done in a collaborative way which, again, compliments the YP's desire for responsibility and promotes avoidance of confrontation and argumentation, which may bring about resistance to change (Naar & Suarez, 2011; Tevyaw & Monti, 2004).

The findings regarding the relationship between the majority of MI behaviour counts and summary scores outcomes are inconsistent, making it challenging to draw definitive conclusions. Despite over half of the studies exploring the link between therapist MI-adherent behaviours and outcomes, the majority found no significant relationship. This is incongruent with findings from the adult literature, whereby MI-adherent behaviours have consistently been associated with improved outcomes (Daeppen et al., 2007; Magill et al., 2018; Moyers et al., 2007; Moyers et al., 2009). A possible explanation for this is that specific types of MI-adherent behaviours may be of more importance in relation to outcomes than others. For example, the use of greater levels of complex reflections, an MI-adherent skill, was found to be related to improved outcomes for YP in this review. This is consistent with the adult literature in which complex reflections have been found to be one of the only MI-adherent behaviours to produce change talk (Gaume et al., 2010). Additionally, it may be that therapists demonstrated high levels of MI-adherent behaviours such as asking open questions but did not incorporate more evocative questions to explore ambivalence (Miller & Rollnick, 2002). This may have therefore limited the impact on change and YP outcomes (Tollison et al., 2008; 2013). It may also be that there are causally important processes, such as evocative questions, that current MI fidelity measures do not assess in depth.

Conversely, MI non-adherent behaviours appeared to have a consistent, negative link with outcomes, although this was only explored in a small number of studies (Borsari et

al., 2015: study 1; Caccavale et al., 2019; Gaume et al., 2014). This finding complements the existing adult literature in which therapists' use of MI non-adherent behaviours have been consistently related to poorer outcomes (Apodaca & Longabaugh, 2009; Karno & Longabaugh, 2004; Magill et al., 2014; Romano & Peters, 2016). This finding is also consistent with the fact that MI non-adherent behaviours appear to be incongruent with the developmental priorities of YP. For example, an MI therapist who confronts or directs without permission from the client is likely to conflict with the young person's desire to exert their need for independence and responsibility in decision making (Baer & Peterson, 2002; Naar & Suarez, 2011).

Strengths and Limitations of Reviewed Studies

A strength of the reviewed studies was the use of validated MI fidelity measures, thus increasing the overall internal validity and ability to make comparisons across studies. However, one study used the YACS-11 which does not provide a checklist of therapist MI skills and behaviours (Norberg et al., 2014). This reduces the study's reliability and the ability to confidently extract the key findings for this review. A further strength was that the majority of studies used a longitudinal design, which allowed outcomes for YP to be examined over time (Caruana et al., 2015).

Several important limitations are noted for the included studies. The majority of studies were undertaken in the US, thus reducing the generalisability to other populations and cultures. Additionally, a large proportion of studies explored numerous relationships between MI skills and outcomes which were often not hypothesis driven comparisons, and thus increases the chance of Type I errors. Conversely, it is also plausible that significant

relationships were not found due to the small sample sizes of a number of the studies, thus increasing the likelihood of Type II errors.

Additionally, the majority of studies focused on substance use, with only three studies investigating MI in relation to health conditions. This is likely reflective of the fact that MI was initially developed to address substance use disorders (Miller, 1983), and that its use in other health related areas is relatively recent (Schaefer & Kavookjian, 2017). However, this reduces the generalisability of the findings to other populations of YP with, for example, chronic illnesses. Perhaps as a result of the significant focus on substance use, the mean ages for the majority of studies was between 18 to 19 years. As the inclusion age range for studies was from 12 to 25 years of age, the lower ages of this age range may not be adequately represented by this review.

Furthermore, a large proportion of the included studies conducted secondary data analyses from RCTs. Whilst this is an effective approach to expediting translation of research results into knowledge (National Institutes of Health [NIH], 2003), it is not without limitations. Firstly, the available data was not collected to address the research question or hypotheses identified by the researchers (Cheng & Phillips, 2014). This can often result in missing data and important information about the study, thus impacting on further analyses. A number of studies included in the review used data from a sub-sample of participants with available audio-recordings of MI sessions, thus resulting in small sample sizes. This not only reduces the overall statistical power of the study, but also brings into question the representativeness of the sample. Furthermore, there was no experimental manipulation of therapist MI skills across the studies and training and experience between therapists greatly varied. This is likely to have confounded the quality of the MI delivered and ultimately the client outcomes. Finally, a number of studies used self-report outcome

measures and did not identify the validity or reliability of these measures. This is a significant limitation, as self-report measures are at risk of social desirability, biasing the results.

Strengths and Limitations of the Review

A key strength of the current review was the search strategy including both peer reviewed articles and grey literature. This enabled a reasonably comprehensive search, thus increasing the chance of including relevant studies and reducing the risk of publication bias. Furthermore, the development of a protocol with clear inclusion and exclusion criteria reduced the impact of subjective bias on judgements made by reviewers at the screening and eligibility stages, thus increasing reliability of the process. Using multiple reviewers also reduced the chance of excluding relevant studies, thus further increasing the inclusive nature of the review. Together, these factors increase the both the transparency and replicability of the review (Gough et al., 2012).

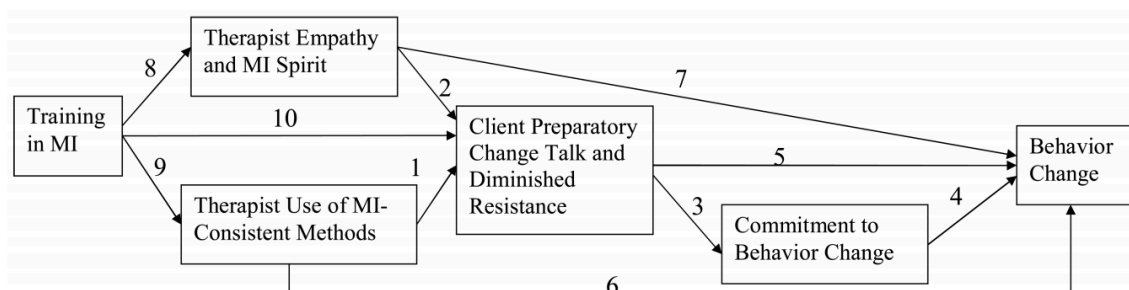
Despite these strengths, there are noteworthy limitations to the current review. Firstly, only two databases and HIV conferences were used for the initial search thus limiting the breadth of potential studies to be included. Further searches in additional databases and of general MI conferences would have broadened the inclusion of articles. Secondly, as the literature on this specific area of MI is limited, studies of varying methodological quality were included to present a comprehensive review of the literature. Although the MMAT is a robust measure of quality assessment, it was challenging to use for this review as a number of the study designs did not clearly fit the pre-defined criteria. This was particularly the case for a large number of articles which undertook secondary analyses of previously collected

data. The review is also limited by the small percentage of included articles which were independently rated and quality assessed by a second reviewer.

Furthermore, by predominantly focusing on therapist within-session behaviours, specific client variables such as change talk, were not considered. Indeed, the causal model of MI hypothesises that both client change and sustain talk mediate the efficacy of MI. Existing evidence from adult populations supports this and has demonstrated that client change talk is related to behavioural outcomes (Moyers et al., 2009; Pirlott et al., 2012; Vader et al., 2010). In the YP literature specifically, two studies have found support for a significant relationship between client change talk and substance use outcomes (Baer et al., 2008; Engle et al., 2010). It is therefore plausible that outcomes may be mediated by both MI therapist skills directly and through client change and sustain talk as a result of MI skills. This is illustrated in a causal chain model developed by Miller and Rose (2009; Figure 2). Whilst the review supports the evidence and pathway for therapist MI skills directly impacting outcomes (pathways 6 and 7 in Figure 2), it is also important to consider the indirect link between therapist MI skills and behaviour as mediated by in-session client responses (Apodaco & Longabaugh, 2009; Miller & Rose, 2009) (pathways 1 and 2 in Figure 2).

Figure 2

Miller & Rose (2009): Causal Chain Model of Process and Outcome Variables in MI



This model also highlights the impact of MI training on behavioural outcomes. Exploration of this particular relationship was beyond the scope of the current review. However, it is of note that there was considerable variability in the experience and training of MI in therapists across studies. This is likely to have impacted on the synthesis of the results and further limits the definitive conclusions that can be made from the current review.

A final limitation relates to the significant heterogeneity of the therapist and YP samples, MI fidelity tools and outcome measures for YP used across the included studies. These factors inevitably reduce the overall internal validity of the review. As a result, it was not possible to conduct a meta-analysis, which reduces the overall power of the review.

Research and Practice Implications

Despite the consistent evidence that MI positively influences outcomes for YP (Kohler & Hofmann, 2015; Schaefer & Kavookjian, 2017), there remain few process studies

exploring the mechanisms through which this is achieved. It is evident from this review that research is emerging in this area and it is important that this continues. Doing so will enable tailoring of MI training and interventions for YP. For example, translating the finding of a relationship between therapist MI non-adherent behaviours and poor outcomes in YP into clinical practice will enable both therapists and supervisors to identify and reduce the occurrence of these behaviours (Magill et al., 2014). Ultimately, this may result in improved outcomes for YP.

Furthermore, research would benefit from broadening the focus of MI process research to other physical health conditions which impact YP. Chronic conditions such as diabetes, asthma, inflammatory bowel disease and HIV all require significant self-management and medication adherence (Cramer, 2004; Murphy et al., 2005; Pai & Ostendorf, 2011). MI interventions have demonstrated improvements in adherence, symptoms and quality of life in YP with such conditions (Schaefer & Kavookjian, 2017). However, it remains unclear as to which MI skills, if any, are related to YP outcomes across these conditions. Clinicians, such as nurses and community health workers, who have regular contact with YP with these conditions could then be trained to include tailored MI approaches in their clinical work. Indeed, previous research has demonstrated the feasibility of training paediatric healthcare providers in MI (Lozano et al., 2010). In doing so, there is opportunity for healthcare providers to boost quality of life in YP and increase the availability and access of such interventions for this population (Schaefer & Kavookjian, 2017).

Future research would also benefit from considering additional variables that may moderate, mediate or confound the relationship between MI skills and outcomes, such as the age of the YP and years of MI training and experience of the therapist.

Conclusions

Overall, the review has identified consistent evidence to support a link between greater levels of therapist MI spirit and improved outcomes in YP. Additionally, it was consistently found that MI-adherent skills were not associated with outcomes. There was limited and varied evidence for the remaining MI skills and their relationship with YP outcomes. Nonetheless, the current review highlights the importance of monitoring and evaluating therapist skills in relation to outcomes for YP both in future research and clinical practice. In doing so, training and implementation of MI in clinical settings can be tailored to provide more effective and targeted interventions for this population.

**Motivational Interviewing Fidelity and Health Outcomes for Young People Living with HIV
in the United States**

Abstract

Young people (YP) aged 10 to 25 are disproportionately affected by HIV. High rates of risk behaviours including alcohol consumption and poor adherence to antiretroviral therapy (ART) contribute to poor outcomes in this age group. Motivational Interviewing (MI) has been demonstrated as an efficacious intervention to improve ART adherence, reduce alcohol consumption and improve viral load. Limited availability of MI has prompted training of paraprofessionals without formal mental health training to deliver MI. However, MI process research has not yet explored the quality of MI delivered by paraprofessionals and the relationship to outcomes for YP living with HIV. Investigation of this will enable tailoring of MI training and interventions. Secondary data from a randomised controlled trial (RCT) in the United States (US) was analysed in which 65 YP living with HIV (9 female, mean age 21 years) were randomised to receive four MI sessions in the home or clinic setting. All sessions were delivered by existing paraprofessionals at HIV clinics. Paraprofessionals' use of MI skills were coded from audio-recorded MI sessions using the Motivational Interviewing Treatment Integrity code (MITI: Moyers et al., 2016). Multi-level models were developed to analyse the association between MI skills and outcomes (viral load and alcohol consumption) at four time points (pre-intervention and 16, 28 and 52 weeks post-baseline). MI partnership, a specific MI skill which promotes power sharing in the dynamic, was associated with reduced alcohol consumption outcomes. No other MI skills were associated with outcomes. Exploratory analysis identified a group difference in outcomes for MI delivered in the clinic setting associated with alcohol consumption. This relationship was independent of MI partnership scores. Further process research using fidelity measures capturing both therapist and client behaviour and sequential analysis of these interactions is necessary to clarify the relationship between MI skills and outcomes for YP living with HIV.

Introduction

Young people (YP) aged 10-25 with Human Immunodeficiency Virus (HIV) have significantly worse outcomes than that of any other age group (MacPherson et al., 2015). As a group, they face unique challenges in navigating adolescence and emerging adulthood whilst living with a stigmatised, chronic condition. Specifically, rates of adherence to antiretroviral therapy (ART), the gold-standard treatment for HIV management, are significantly reduced in this group (MacDonnell et al., 2013). Evidence has demonstrated the efficacy of Motivational Interviewing (MI) in improving associated health outcomes and ART adherence rates in this population (Naar et al., 2006; 2009; 2010). However, access to such interventions is limited due to a lack of professionals trained to deliver MI. Recent research has therefore explored the efficacy of training paraprofessionals without formal mental health training to deliver MI in the community to improve access and more sustainable outcomes (Naar et al., under review). However, becoming proficient in MI is challenging, particularly for those without prior counselling experience (Miller & Mount, 2001). The quality (measured by therapists' use of specific MI skills) and effectiveness of MI when delivered by paraprofessionals to YP living with HIV is under-researched. Investigating the mechanisms of change in MI when delivered by paraprofessionals is critical to enable tailoring of MI training and enhancement of MI interventions for this group.

HIV: An Overview

HIV is a retrovirus which infects cells within the body's immune system. Rapid replication of the virus within these cells causes progressive impairment of the immune system, resulting in immunodeficiency. Without treatment, HIV positive individuals are at greater risk of developing opportunistic and life-threatening infections, such as hepatitis and

cancers (Adler et al., 2012). Untreated HIV in YP has been associated with growth failure, lung and cardiac diseases and death (Bernays et al., 2014; MacPherson et al., 2015).

HIV disproportionately affects YP globally. In 2018, 510,000 YP aged 10 to 25 worldwide were diagnosed with the condition (UNICEF, 2019). Further figures suggest approximately two million YP aged 10-19 globally are living with HIV today (UNICEF, 2017). It remains the only age group in which HIV-related deaths are increasing (UNAIDS, 2016; Idele et al., 2014). This has been attributed to “a lack of support to remain in care and adhere to ART” (World Health Organisation [WHO], 2013, p. viii).

Antiretroviral Therapy

Despite no cure existing for HIV, ART has significantly improved the life expectancy and quality of life for those living with the condition (Farnham et al., 2013). As such, HIV can now be managed as a chronic condition (Chu & Selwyn, 2011). If taken correctly, ART suppresses the replication of the virus, resulting in a significantly reduced viral load (the amount of detectable HIV in the blood). This enables the immune system to strengthen and fight infections (Lima et al., 2008). ART can be accessed across all states in the US with or without healthcare insurance through services such as the Ryan White HIV/AIDS program and AIDS Drug Assistant Programme (ADAP) which support free access to ART.

Adherence to ART has been shown as the only predictor of achieving an undetectable HIV viral load (Flynn et al., 2004). However, ART regimens can be burdensome and some rely on 85-90% adherence rates for successful suppression of HIV replication (Murphy et al., 2001; Shegog et al., 2012). ART regimens can include taking between two to four tablets per day, with consistent dose timing being particularly important for ART

effectiveness. Resistance and reduced treatment benefits can occur as a result of missing as few as 5% of doses (Lima et al., 2008).

The Information-Motivation-Behavioural Skills (IMB) model of ART adherence (Fisher et al., 2008) provides a theoretical model of factors which determine adherence. The model describes individuals' ART adherence as a result of the interplay between: (1) possession and understanding of information relating to ART and adherence requirements; (2) motivation to adhere and (3) behavioural skills which promote adherence. This model has been successfully applied to interventions addressing ART adherence issues, including MI approaches (Kalichman et al., 2005; Parsons et al., 2007).

HIV in Young People

The highest prevalence rates of HIV in YP exist in low-income countries, with many in sub-Saharan Africa (Lowenthal et al., 2014; UNICEF, 2017). However, a significant proportion of YP living with HIV are in high income countries such as the United States (US). In 2017, YP aged 13 to 24 accounted for 21% of new HIV diagnoses in the US (Centers for Disease Control & Prevention [CDC], 2017). This particular population are disproportionately from black, African American, Hispanic or Latino ethnicities, with a significant number also known to be living in poverty (CDC, 2017). It has been suggested that racial stigma can layer onto HIV stigma (Parker & Aggleton, 2003; Novick, 1997), and thus create further barriers to engagement with HIV services and management of the condition for this particular population.

YP can acquire HIV through two modes of transmission: (1) perinatally, through mother-to-child transmission during pregnancy, birth or breastfeeding or; (2) behaviourally, through unprotected sexual contact or the use of contaminated needles during substance

use (Nesheim et al., 2012). Sources suggest generally equal rates of perinatally and behaviourally acquired HIV in YP globally (UNICEF, 2017). In the US, however, rates of behaviourally acquired HIV are significantly greater and account for the largest percentage of YP seen in HIV clinics (AIDS Info, 2019).

ART Adherence in YP Living with HIV

The developmental stages of adolescence (ages 10 to 19) and emerging adulthood (ages 20 to 25) involve significant biological, emotional, cognitive and social transitions. Throughout these transitions, YP engage in exploration of relationships, sexuality and identity, whilst parental support typically begins to reduce (Arnett, 2014). This is often accompanied by reduced inhibition and an increase in risk-taking behaviours, such as substance use and unprotected sexual contact (Galvan et al., 2007). Navigating these normative tasks of adolescence and emerging adulthood whilst living with a stigmatised condition requiring lifelong treatment poses unique challenges and consequences for YP living with HIV (Swendeman et al., 2006). This can ultimately impact on their HIV management, specifically in terms of reduced ART adherence rates (MacDonell et al., 2013).

ART adherence is greatly reduced in YP living with HIV in comparison to adults (Kim et al., 2014), and is cited as the primary cause of treatment failure in this age group (Flynn et al., 2007). Studies dating back over a decade highlight poor adherence rates in this age group (Flynn et al., 2004; Murphy et al., 2003). These rates have continued to date with estimates of fewer than 60% of YP adhering to ART over 85% of the time (Kerrigan et al., 2018).

Adherence difficulties in YP with HIV are driven by numerous psychosocial factors, some of which appear in the IMB model. Complex life-long regimens (Bernays et al., 2014)

and a desire to fit in with peers can motivate YP to take medication in secret, thus missing required consistent dose times. Some YP may miss doses altogether (Kawuma et al., 2014), leading to treatment resistance and increased viral load levels. YP have cited ART as a daily reminder of living with HIV, intensifying their feelings of 'difference' and a profound sense of social isolation (Cluver et al., 2012). This puts YP living with HIV at greater risk of depression and other mental health problems (Calabrese et al., 2012). The IMB model highlights mental health as a moderating factor which can affect adherence. Indeed, evidence has demonstrated that mental health difficulties further exacerbate ART adherence difficulties (Hosek et al., 2005). It has been argued that there is a need for further research and scaling up of adherence support for YP to both improve overall wellbeing and to reduce onward transmission to others (Kim et al., 2014).

Alcohol Consumption in YP and the Relationship to ART

Substance use is a further major contributing factor to poor ART adherence (MacDonell et al., 2013; Zandoni & Mayer, 2014) and is highlighted in the IMB model of ART adherence as a key moderating factor affecting adherence (Fisher et al., 2008). Alcohol is the most commonly used substance in YP in the US, and rates of consumption are particularly high in YP living with HIV (Murphy et al., 2001; Tanney et al., 2010). Alcohol consumption has been consistently associated with decreased ART adherence (Azar et al., 2010) and accelerated HIV progression (Hahn & Samet, 2010; Michel et al., 2010). It has also been linked with an increase in sexual risk-taking behaviours (Elkington et al., 2015), driven largely by a reduction in impulse control (Jessor et al., 2006). Unprotected sexual contact increases both the risks of onward HIV transmission and contraction of sexually transmitted infections, which can further impact on HIV viral load (Smith et al., 2005).

It has been argued that alcohol consumption should be addressed prior to commencing ART to avoid compromising treatment (Zanoni & Mayer, 2014). Recommendations and efforts to address this specific risk behaviour in YP have been largely unsuccessful and adherence issues and related health outcomes for this population remain prevalent (D'Angelo et al., 2006). As a result, research has increasingly focused on the use of MI to address these behavioural factors in YP living with HIV.

Motivational Interviewing

MI is a “client-centered, directive method for enhancing intrinsic motivation to change by exploring and resolving ambivalence about change” (Miller & Rollnick, 2002, p.23). It is delivered in a manner that is congruent with the spirit of MI, including avoiding argumentation, supporting self-efficacy and expressing empathy (Miller & Rollnick, 2013). Therapists are trained to use specific client-centred counselling skills such as open ended questions, reflective listening and affirmation of the client’s utterances.

MI has been established as an effective intervention for improving a variety of health behaviour related outcomes in YP (Schaefer & Kavookjian, 2017). For YP living with HIV, MI has been associated with improvements in ART adherence (Kennard et al., 2014) and retention in HIV care (Naar et al, 2009). Reductions in alcohol consumption (Murphy et al., 2012), viral load (Naar et al., 2006; 2009; under review) and unprotected sexual behaviours (Naar et al., 2006) have also been attributed to MI.

Task-sharing in MI

Traditionally, MI is delivered by mental health professionals with previous counselling experience in clinic settings. Subsequently, access to MI is limited (Naar et al.,

under review). This is particularly the case for YP living with HIV in the US who face additional barriers to access including HIV anticipated stigma (and subsequent fear of being seen at an HIV clinic by the community), lack of health care funding, associated transport costs and long travelling distances (Maskew et al., 2016; UNIADS, 2018). It has been argued that a task-sharing approach may improve accessibility and sustainable outcomes for YP living with HIV in a cost-effective way (Ellis et al., 2006; Kim et al., 2014; Naar et al., 2009; 2010). Task-sharing involves non-specialist professionals without previous mental health training in the delivery of services that are currently performed by trained mental health professionals (Patel, 2011). Often referred to as paraprofessionals, this can include a variety of clinicians such as nurses and community health workers.

Research has demonstrated the efficacy of training paraprofessionals to deliver MI in both YP and adults (Jacques-Tiura et al., 2019; Jelalian et al., 2014; Murphy et al., 2012). Naar et al. (2009) trained peer workers and masters-level staff to deliver MI to YP with the aim of improving retention in HIV care. Peer workers demonstrated a greater effect size of retention in care and a larger intervention dose than that of the masters-level staff. The authors suggest that the findings support the feasibility of paraprofessionals delivering MI in services. A recent RCT sought to further the accessibility of MI by having paraprofessionals within existing HIV services deliver MI in both clinic and community settings (Naar et al., under review). The authors argued that delivery of MI within the client's home may increase accessibility, engagement and sustained outcomes for YP living with HIV. Indeed, improved outcomes were found across both settings in terms of viral load and alcohol consumption. However, contrary to hypotheses, YP had significantly greater reductions in viral load when MI was delivered in the clinic setting. Whilst the study provides further support for the efficacy of paraprofessionals delivering MI to YP living with HIV, it is unclear as to why

improvements in outcomes were not comparable in the home setting. One potential hypothesis is that the quality, or fidelity to MI by paraprofessionals in this setting differed to that in the clinic setting.

Despite the suggested feasibility of training paraprofessionals to deliver MI to YP, developing competencies and becoming proficient in MI is challenging, particularly for those without prior counselling experience (Miller & Mount, 2001). Monitoring the quality and fidelity of MI is therefore particularly important in services implementing task-sharing approaches.

MI Fidelity

The way in which MI is delivered has been suggested as an important and distinctive element to the change process (Miller & Rollnick, 2014). Treatment fidelity, the extent to which an intervention is delivered by therapists reliably and validly (Bellg et al., 2004), can account for variability in the effectiveness of MI (Magill et al., 2018; Moyers et al., 2007). Indeed, it has been shown that clinicians significantly vary in their effectiveness at delivering the same MI interventions (Project MATCH Group, 1998). With the acknowledged efficacy of MI, the focus of recent research has shifted towards understanding the particular delivery conditions of MI and how this impacts its efficacy.

A theoretical model developed by Miller and Rose (2009) suggests two complementary hypotheses for the therapeutic effects of MI. The model proposes that MI training leads to greater levels of: (a) technical skills (the use of specific MI skills to promote behaviour change) and (b) relational skills (therapist conveyance of empathic understanding and MI spirit) in the MI therapist. These components are then hypothesised to directly or indirectly (as mediated by client change and sustain talk) impact on behaviour change.

Coding systems such as the Motivational Interviewing Treatment Integrity code (MITI: Moyers et al., 2014) have been developed as measures of MI fidelity for use in both clinical and research settings. MI fidelity measures capture specific therapist MI skills, such as the use of open and closed questions or simple and complex reflections, which are coded by a trained expert (Moyers et al., 2005b). Indeed, recent systematic reviews have demonstrated relationships between specific MI skills and a variety of behavioural outcomes for adults (Apodaca & Longabaugh, 2009; Magill et al., 2014; 2018). This relationship has also been demonstrated in studies with HIV positive adults, providing evidence for the technical pathway of MI and thus suggesting that MI therapist skills are in some way associated with client outcomes (Thrasher et al., 2006; Grodensky et al., 2017).

For YP, process research of the relationship between MI skills and outcomes is still in its infancy. The previously presented systematic review identified that the literature is inconsistent and further research examining this relationship is required, particularly in YP living with HIV and when MI is delivered by paraprofessionals. Indeed, variable MI competence levels of paraprofessionals have been found ranging from suboptimal to comparable with mental health clinicians (Fromme & Corbin, 2004; Naar et al., 2009; Tollison et al., 2008). There has, however, been no direct exploration of the relationship between paraprofessional MI skills and outcomes for YP living with HIV (MacDonell et al., 2019). Understanding this relationship is crucial to improving MI training, delivery of MI by paraprofessionals and ultimately outcomes for this group (Kazdin & Nock, 2003).

This study therefore aimed to examine whether health related outcomes for YP living with HIV are associated with paraprofessional therapists' MI competence and skills. It was hypothesised that greater MI competence (demonstrated by paraprofessionals' use of MI skills) would be associated with improved outcomes for YP living with HIV. Further

exploratory analysis was undertaken to examine whether group differences in outcomes for YP engaged in home versus clinic delivered MI were independent of therapist fidelity to MI.

The study therefore addressed the following research questions:

1. Are MI skills and competence in paraprofessional MI therapists associated with outcomes (alcohol consumption and HIV viral load) in YP living with HIV?
2. Are any group differences in viral load and alcohol consumption in participants engaged in MI in a home versus clinic setting independent of any MI skill that is associated with outcomes in YP?

Method

Design

This study was a retrospective, longitudinal secondary analysis of the relationship between MI skills demonstrated by paraprofessionals and HIV viral load and alcohol consumption in YP living with HIV. The data was collected as part of an RCT carried out in the US (Naar et al., under review), in which YP were randomly allocated to receive MI either in a clinic or home setting.

Sample

Young People

Data from participants with a minimum of one MITI coded MI session were identified (n=65) from the original study sample (n=183). Participants were eligible to take part in the original study if they had detectable HIV viral loads (above 20 copies/ml) and were between the ages of 16-25, English-speaking, offered a prescription for ART (currently taking or not) and had consumed any amount of alcohol in the previous 12 weeks.

Additional inclusion criteria for the current study were: one MITI coded MI session and viral load and alcohol consumption data from at least one time point. Of the 65 participants included in the study, 66.15% (n=43) had outcome data at four time points, 20% (n=13) had outcome data at three time points and 13.85% (n=9) had outcome data at 2 time points. The sample size was not based on a power calculation as all participants meeting the inclusion criteria for the current study were included.

All participants in the original study were randomised to receive four one-to-one sessions of MI over a 12-week period with a paraprofessional community health worker in either (a) the client's home or other community setting (n=90, 49.18%) or (b) the clinic

(n=93, 50.82%). Of the subsample identified for the current study, 27 (41.54%) received MI in the community setting and 38 (58.46%) received MI in the clinic setting.

MI Therapists

The MI intervention was delivered by eight paraprofessional community health workers (e.g. outreach workers, case managers). The paraprofessionals were existing members of HIV care teams based across five clinic sites in the US (Chicago, Detroit, Los Angeles, Memphis and Philadelphia). At least one paraprofessional was based at each site. All paraprofessionals delivered the intervention both in the home and clinic setting.

The MI paraprofessional therapists (henceforth 'MI therapists') and their local supervisors attended a three-day MI training workshop, followed by a three-month period of role-play practice. This was audio recorded and submitted for assessment using the MITI fidelity coding system. At the point of achieving beginner competency levels on the MITI scales (e.g., meeting a minimum threshold of the reflection-to-question ratio), MI therapists were cleared to see participants. All MI therapists received weekly supervision with their local supervisors throughout the study. All MI sessions were audio-recorded with one recording per therapist randomly selected for MITI coding. Audio recordings were reviewed and scored for fidelity using the MITI throughout the trial by the research team. If MITI scores fell below competency levels, the research team joined supervision sessions with the MI therapists to offer additional support.

Ethical approval for the original RCT was obtained by each site's review board and a certificate of confidentiality was obtained from the National Institutes of Health (NIH). This study was granted ethical approval from the Royal Holloway University of London Research

Ethics Committee in December 2019 (Appendix 1). All data was de-identified by the US research team prior to transferring for use in this study.

Measures

Demographic and Baseline Clinical Information

Baseline demographic information was collected from all participants at the point of entry to the original RCT. This included: age, gender at birth, sexual orientation, relationship status, ethnicity, highest education level and current employment status. HIV-specific clinical variables were also collected, including: age at diagnosis, mode of transmission, length of time prescribed ART medication, HIV disclosure status and substance use in the past 30 days.

The following measures from the original study were completed at baseline, prior to the MI intervention, and again to collect follow-up data at 16, 28 and 52-weeks post-baseline.

Alcohol Consumption

Participants' alcohol consumption in the past 30 days was collected using the Timeline Follow Back interview schedule (TLFB: Sobell & Sobell, 1992). This self-report measure requires participants to provide retrospective estimates of their daily drinking over the previous month. A calendar is used as a memory aid, with the participant encouraged to note specific events occurring in the previous month to support accurate recall of alcohol consumption. The TLFB has been demonstrated as a valid measure in detecting alcohol consumption and has been suggested to be superior in quantifying alcohol consumption in comparison to biological samples (Hjorthøj et al., 2012). It has been shown to be a reliable

tool to assess alcohol consumption in HIV populations (Wray et al., 2016) and in adolescents (Harris et al., 2016). It has demonstrated high test re-test reliability for measuring drinking days and drinks per occasion in adolescents (Levy et al., 2004). For the purposes of the current study, the number of drinks consumed in the heaviest drinking week by participants was used as an outcome measure for alcohol consumption.

HIV Viral Load

HIV viral load for each participant was either extracted from recent medical records or collected via blood samples in the clinic if a recent viral load measure was unavailable. A viral load test measures the amount of HIV particles in the blood sample and results are defined as the number of copies of HIV per millimetre of blood. A detectable viral load for the purposes of the study was defined as greater than 20 copies per millilitre (copies/ml).

MI Fidelity

Therapists' fidelity to the MI intervention was assessed from a randomly selected twenty minute subsection of a single MI session using the MITI version 4.1 (Moyers et al., 2014). The MITI is the most frequently used behavioural coding instrument for assessing MI fidelity. Two types of component scores are produced from the MITI: global scores and behaviour counts (see Table 7). Global scores are rated on a five-point Likert scale (1=low to 5=high) and reflect the coder's overall impression of the therapist performance across four dimensions. Behaviour counts are measured by the coder tallying the frequency of specific MI therapist skills occurring in the selected subsection. MITI behaviour counts have been found to have greater inter-rater reliability than global scores (Seng & Lovejoy, 2013).

Finally, summary scores are calculated from behaviour counts as broader measures of MI competence (Table 8).

Four studies have demonstrated acceptable reliability of the MITI subscales (Copeland et al., 2018; Moyers et al., 2016; Owens et al., 2017; Schmidt et al., 2019). One study, however, reported low reliability on some of the global measures within the MITI (Copeland et al., 2018). Satisfactory construct and predictive validity has also been demonstrated (Moyers et al., 2016, Owens et al., 2017).

Based on the evidence of relationships between specific MI skills and ART adherence outcomes for HIV positive adults (Grodensky et al., 2017; Thrasher et al., 2006) and for a variety of behavioural outcomes for YP as demonstrated by the previously presented systematic review, the current study used the following MITI variables as measures of MI fidelity: four global scores (partnership, empathy, cultivating change talk, softening sustain talk), two behaviour counts (MI-adherent and MI non-adherent) and two summary scores (reflections-to-questions ratio and percent complex reflections).

Table 7*Description of MITI 4.1 Global Scores and Behaviour Counts Used in the Analysis*

Global scores	Description
Partnership	Therapist conveys to client that both are equal partners in the dynamic but that ultimately the expertise and wisdom about change sits within the client.
Empathy	Therapist actively attempts to understand and convey their understanding of the client's perspective beyond what the client verbalises.
Cultivating change talk	Therapist explicitly encourages the client's language in favour of change and builds momentum of change talk.
Softening sustain talk	Therapist makes consistent efforts to decrease the client's language against change and to move the conversation away from sustain talk, towards the target change goal.
Behaviour counts	
MI-adherent	Includes therapist behaviour counts of emphasising autonomy, seeking collaboration and affirming the client's strengths and efforts.
MI non-adherent	Includes therapist behaviour counts of confronting (e.g. disagreeing, correcting, arguing) and persuading (without permission).

Table 8

MITI 4.1 Summary Scores Used in the Analysis

Summary score	Description
Percent complex reflections	Number of complex reflections divided by the number of simple reflections plus complex reflections
Reflection to question ratio	Total number of reflections divided by total number of questions

Analysis

The data were analysed using IBM SPSS software version 23 (IBM, 2012). All data were initially screened for normality prior to conducting descriptive analysis. The outcome variables (viral load and alcohol consumption) were tested for skew and kurtosis to determine normality. The distribution of both viral load and alcohol consumption data were skewed, so a logarithmic (log₁₀) transformation was carried out and used in subsequent analyses.

Multilevel Model Analysis Plan

A multilevel model (MLM) analysis approach was used to investigate the relationship between participants' outcome data across four time points and MI therapist skills as measured by the MITI. MLM was selected as an analysis approach to take into account the hierarchical structure and clustering of the data with repeated observations over time (level 1), nested within individuals (level 2) (Goldstein, 2011). It is an analysis approach that is superior in managing missing data, without resorting to removal of entire cases (Raudenbush & Bryk, 2002). This was crucial in the current analysis due to the existing small

sample size of those with MITI coded sessions (n=65) and potential loss of statistical power that would occur if listwise deletion was used. Furthermore, it has been argued that ignoring hierarchical structures in analysis can lead to biased standard error estimates thus resulting in overstatements of statistical significance and increased Type I errors (Hox, 2002). MLM also allows for estimation of both random and fixed effects.

All data were restructured in SPSS into univariate (long) format, thus each time point per participant was represented by a row in the dataset. It was not necessary to grand mean centre the data for the dependent variables (viral load and alcohol consumption) or the predictor variables (MITI scores) as they all have meaningful values of zero (Wu & Wooldridge, 2005). To assess the association between outcomes for YP and therapist MI skills, separate multi-level models were created with each of the eight MITI scores as predictors, and alcohol consumption and viral load as outcomes. Separate models were created to avoid overfitting from a single complex model, which can produce misleading findings (Babyak, 2004). Both main effects and interactions between time and MI skills were also included. Interactions were included to account for the baseline data point which occurred prior to the delivery of the MI intervention.

The model building process was conducted as follows: first, an unconditional null model was created based on a maximum likelihood method. This enables calculation of the variability accounted for by the addition of subsequent predictors based on the minus 2 log-likelihood (-2LL), which is a measure of goodness of fit. It also allows calculation of the intraclass correlation coefficient (ICC), which is the ratio of the between-cluster variance to the total variance. Sufficient variance (greater than 10%: Kahn, 2011) between participants (at level 2) was found in the unconditional null models for both outcomes to justify continued analysis through MLM. Second, time was added as a fixed factor to assess

whether there were changes in the outcome variables between time points. Third, slopes were allowed to vary randomly between participants. Finally, MITI scores and the interaction between MITI scores and time were added as fixed level 2 predictors.

Second, to test whether any significant relationship between therapist MI competence and outcomes was independent of group (home versus clinic), group was added to the conditional model as a level 2 fixed factor, as well as both a level 2 interaction between group and MI skills and a cross level interaction between group and time.

Results

Baseline Demographics and Characteristics of Sample

A sub-sample from the original RCT of 65 participants had MITI coded MI sessions and were therefore included in the current analysis. A Mann-Whitney U test showed no significant differences between the subsample with MITI scores (n=65) and the subsample without MITI scores (n=118) at baseline on the following: current age (U=3210.50, p=.07), age at diagnosis (U=3462.50, p=.28), viral load (U=3290.00, p=.11) or number of drinks in heaviest drinking week (U=3773.50, p=.86). The means and standard deviations of both subsamples on these variables are presented in Table 9. The baseline demographics and HIV related clinical information of participants included in the final sample are presented in Tables 10 and 11.

Table 9

Baseline Descriptive Statistics for Participants With (n=65) and Without MI Coded Sessions (n=118)

Baseline variables	Mean (SD)	
	MITI	No MITI
Current age	21.06 (1.79)	21.56 (1.87)
Age at diagnosis	18.31 (3.87)	18.27 (4.88)
Viral load (copies/ml)	55660.77 (120506.80)	92988.37 (268444.11)
No. of drinks in heaviest drinking week	9.90 (18.90)	9.43 (14.34)

Table 10*Participant Baseline Demographic Information (n=65)*

Variable	Participants	
	Mean (SD)	No. (%)
Age, years	21.06 (1.79)	
Male gender at birth		56 (86.15)
<u>Ethnicity</u>		
Black African/American		54 (83.08)
Mixed		4 (6.15)
White		4 (6.15)
Other (includes Asian & Native American)		3 (4.62)
<u>Sexual orientation</u>		
Heterosexual		10 (15.38)
Homosexual		35 (53.85)
Bisexual		19 (29.23)
Not disclosed		1 (1.54)
<u>Employment</u>		
Employed		33 (50.77)
Unemployed		5 (7.69)
Student		27 (41.54)
<u>Relationship status</u>		
Single		59 (90.77)
Steady partner, living together		6 (9.23)

Table 11*Participant Baseline HIV Related Clinical Information (n=65)*

Variable	Mean (SD)	N (%)
Age at diagnosis	18.31 (3.87)	
<u>Mode of transmission</u>		
Perinatally acquired		5 (7.69)
Behaviourally acquired		57 (87.69)
Don't know		3 (4.62)
<u>Length of time prescribed ART regimen</u>		
One month or less		31 (47.69)
More than one month		34 (52.31)
<u>Disclosure status (to anyone)</u>		
Disclosed		53 (81.54)
Not disclosed		12 (18.46)
<u>Illicit substance use (not alcohol) in past 30 days</u>		
Yes		50 (76.92)
Cannabis		48 (96.00)
Other (cocaine, stimulants, inhalants, hallucinogens)		2 (4.00)
No		15 (23.08)

Descriptive Statistics

Outcome Variables: Viral Load and Alcohol Consumption

The descriptive statistics for both outcome variables at each time point are presented in Table 12. The median is reported given the extreme skewness of the data. Descriptive statistics reflected overall decreases in both viral load and number of drinks in heaviest drinking week from baseline to 52 week follow-up. Caution is warranted when comparing the medians across time points due to unequal numbers of participants with data at each time point.

Table 12

Descriptive Statistics for Viral Load and Alcohol Consumption at Baseline and 16, 28 and 52 Weeks Post-Baseline.

Outcome variable	Median	IQR
Viral load (copies/ml)		
Baseline (n=65)	2051.00	47525.00
16 weeks (n=55)	40.00	513.00
28 weeks (n=36)	40.00	7834.00
52 weeks (n=36)	41.50	622.00
Alcohol consumption (TLFB)		
Baseline (n=65)	6.00	8.00
16 weeks (n=59)	5.00	11.00
28 weeks (n=50)	4.00	5.00
52 weeks (n=53)	4.00	5.00

Predictor variables: MITI

Therapists' fidelity to MI was based on standards described in the MITI manual (Moyers et al., 2014). The average fidelity scores of the therapists in the study are presented in Table 13 in comparison to standard levels of basic competence and proficiency. The manual does not provide competence and proficiency levels for total MI-adherent and MI non-adherent due to a lack of data to inform these scores (Moyers et al., 2014).

Table 13

Paraprofessional MI Therapist Average Rating in Comparison to MI Standard Levels of Basic Competence and Proficiency

MI Skill	Fair	Good	Mean (SD) rating of paraprofessional competence
Relational	4	5	4.04 (0.63)
Technical	3	4	3.70 (0.58)
% CR	40%	50%	42.58 (21.79)
R:Q	1:1	2:1	0.88:1 (0.67)
Total MIA	-	-	3.03 (2.20)
Total MINA	-	-	0.28 (0.86)

Note. Relational=global scores of partnership and empathy; technical = global scores of cultivating change talk and softening sustain talk; % CR=percent complex reflections; R:Q=reflections to questions ratio; MIA=MI-adherent; MINA=MI non-adherent.

MLM Analysis of Therapist MI Competence on YP Outcomes

Viral Load

Unconditional Model.

The unconditional model (Table 14) identified both significant variation within ($b=1.51$, $p<.001$) and between individuals' ($b=.551$, $p=.003$) viral load levels. An ICC was calculated and identified that 26% of the variance was between participants. This therefore highlights clustering at the participant level and justified using multi-level modelling (LeBreton & Senter, 2008).

The addition of time improved the overall fit of the model, as seen by the reduction in overall deviance. A significant linear effect of time was found, in which participants' viral load significantly reduced over time ($b=-8.69$, $p<.001$). Significant within and between individual differences continued to be evident from the residual and intercept estimates after the addition of time as a level 1 factor, suggesting remaining variation to be explained within the model. Attempts were made to include random variation in the slopes to identify individual differences in the rates of change, however the model failed to converge. This is likely a result of the small sample size at this level (McNeish & Stapleton, 2016).

Conditional Model.

Conditional models assessed the effects of MI skills as level 2 predictors for between participant variance (Table 14). Six out of the eight MI skills reduced the overall deviance of the model but the addition of these variables was not significant. All MI skills were unrelated to viral load outcomes and did not significantly improve the overall model fit. There was no interaction between time and MI skill variables for viral load (partnership: $b=0.79$, $p=.66$; empathy: $b=0.50$, $p=.81$; cultivating change talk: $b=-1.46$, $p=.50$; softening

sustain talk: $b=1.24$, $p=.52$; MIA: $b=0.24$, $p=.41$; MINA: $b=-0.25$, $p=.91$; percent complex reflections: $b=-0.01$, $p=.82$; reflections-to-questions ratio: $b=-1.16$, $p=.51$). Following the addition of each MITI variable, there continued to be a significant time effect and a significant amount of variance to explain at both within and between participant levels.

Table 14*Multilevel Model: Unconditional and Conditional Models for the Viral Load Outcome*

Variable	Deviance (2LL)	Change in deviance	<i>b</i>	SE	p-value
<u>Unconditional model</u>					
Intercept	741.01	-	2.71	0.13	<.001
Time	705.82	35.19***	3.32	1.92	<.001
Variance components					
Residual	-	-	1.26	0.15	<.001
Intercept	-	-	0.62	0.18	<.001
<u>Conditional models</u>					
Partnership	704.17	1.65	-0.06	0.21	0.79
Empathy	703.79	2.03	0.06	0.21	0.77
Cultivating change talk	701.63	4.19	0.20	0.22	0.37
Softening sustain talk	702.82	3.00	0.08	0.24	0.74
MIA	707.43	-1.61	0.05	0.07	0.41
MINA	703.28	2.54	-0.02	0.27	0.93
Percent complex reflections	719.80	-13.98	0.00	0.01	0.98
Reflections-to-questions ratio	704.00	1.82	0.09	0.21	0.68

Note. MIA=MI-adherent; MINA=MI non-adherent

***p<.001.

Alcohol Consumption

Unconditional Model.

The unconditional model (Table 15) identified both significant variation within ($b=0.14$, $p<.001$) and between individuals' ($b=0.06$, $p=.001$) alcohol consumption over time. Calculation of the ICC identified that 30% of the variance was between participants. This again suggests significant clustering at this level and justified the use of an MLM approach. The addition of time to the unconditional model improved the overall fit, as demonstrated by the significant reduction in deviance. A significant linear effect of time was found, in which participants' alcohol consumption significantly reduced over time ($b=-0.41$, $p=.01$). Significant within ($b=0.14$, $p<.001$) and between individual ($b=.06$, $p<.001$) differences continued to be evident after the addition of time as a level 1 factor, suggesting remaining variation to be explained within the model. Again, failure of the models to converge meant random variation in the slopes were not included.

Conditional Models.

Individual conditional models were created with each MI skill as level 2 predictors of between participant variance within separate models (Table 15). Only two of the MI skills (global scores of partnership and cultivating change talk) reduced the overall deviance of the model. Cultivating change talk was not, however, associated with drinking outcomes ($b=-0.84$, $p=.28$). There was, though, a negative main effect of partnership on drinking outcomes ($b=-0.15$, $p=.03$), suggesting that greater levels of MI partnership by therapists were associated with reductions in alcohol consumption. The remainder of the MI skills were unrelated to alcohol consumption and did not significantly improve the overall model fit. There was no interaction between time and the MITI variables for alcohol consumption

(empathy: $b=-0.23$, $p=.35$; cultivating change talk: $b=-0.26$, $p=.33$; softening sustain talk: $b=-0.01$, $p=.98$; MIA: $b=-0.03$, $p=.73$; MINA: $b=-0.44$, $p=.15$; percent complex reflections: $b=-0.09$, $p=.61$; reflections-to-questions ratio: $b=0.01$, $p=.98$). Again, there continued to be a significant time effect and a significant amount of variance to explain at both within and between participant levels following the addition of each MITI variable.

Table 15*Multilevel Model: Unconditional and Conditional Models for Alcohol Consumption Outcomes*

Variable	Deviance (2LL)	Change in deviance	<i>b</i>	SE	p-value
Unconditional models					
Intercept	262.98	-	0.66	0.04	<0.001
Time	258.54	4.44*	-.041	0.16	0.01
Variance components					
Residual	-	-	0.13	0.02	<0.001
Intercept	-	-	0.07	0.02	0.001
Conditional models					
Partnership	258.38	0.16	-0.15	0.07	0.03
Empathy	259.81	-1.27	-0.60	0.07	0.42
Cultivating change talk	258.19	0.35	-0.84	0.08	0.28
Softening sustain talk	259.72	1.18	-0.12	0.08	0.15
MIA	263.53	-4.99	-0.03	0.02	0.13
MINA	260.05	-1.51	0.04	0.10	0.67
Percent complex reflections	263.15	-4.61	-0.03	0.05	0.58
Reflections to questions ratio	262.73	-4.19	-0.05	0.07	0.47

Note. MIA=MI-adherent; MINA=MI non-adherent

*p<.05.

MLM Exploratory Analysis of Group Differences in Outcomes

Viral Load

There was no significant difference in viral load between participants receiving MI in the clinic versus home setting ($b=-0.18$, $p=.60$). Additionally, no significant interaction between time and group for viral load was found ($b=1.90$, $p=.08$) although this was close to significance. As MI partnership was the only MITI variable to be significantly associated with YP outcomes, this was added to the exploratory model. The addition of the partnership MI skill to the model was also not significant ($b=-0.03$, $p=.87$) and group estimates did not significantly change following this addition to the model ($b=-0.18$, $p=.60$). The latter finding suggests that MI partnership is unlikely to be mediating the relationship between location and outcome.

Alcohol Consumption

Participants receiving MI in the clinic setting demonstrated greater reductions in alcohol consumption than those in the home setting ($b=-0.19$, $p=.05$). There also continued to be a significant main effect of time ($b=-0.52$, $p=.02$), suggesting that viral load reduced in participants over the time points. There was no significant interaction between group and time ($b=0.28$, $p=.39$). The addition of the partnership MI skill to the model was significant ($b=-0.12$, $p=.03$), suggesting that greater levels of MI partnership by the therapist was associated with lower levels of alcohol consumption in participants. However, the group estimate did not significantly change following addition of MI partnership to the model ($b=-0.18$, $p=.05$), which suggests that the effects of group and partnership are independent of each other. Thus, again, MI partnership is unlikely to mediate the relationship between location and alcohol consumption.

Discussion

The aim of this study was to investigate whether paraprofessional MI skills are associated with outcomes for YP living with HIV. Further exploratory analysis sought to examine whether group differences in outcomes for YP engaged in home versus clinic delivered MI were independent of therapist fidelity to MI.

Contrary to hypotheses, seven of the eight MI skills were not significantly associated with outcomes for YP living with HIV. The results suggest that greater levels of MI partnership were, however, associated with lower levels of alcohol consumption in YP. Despite evidence of significant reductions in YP's viral load and alcohol consumption over time, the findings suggest that this is unlikely a result of MI paraprofessional therapist fidelity.

Global MITI Scores

The association between MI partnership and alcohol consumption is in keeping with the literature highlighted in the previously presented systematic review identifying a link between MI spirit, of which partnership is a core component, and outcomes for YP (Bertholet et al., 2014; Borsari et al., 2015; Ewing et al., 2015; Gaume et al., 2014; McCambridge et al., 2011; Pollak et al., 2009). This finding also provides tentative support for the relational pathway of MI (Miller & Rose, 2009). Therapists' use of MI partnership encourages a collaborative dynamic and prioritises the client's contributions in influencing the nature of the session (Moyers et al., 2016). This skill appears to complement the developmental needs of YP in striving for independence and increased responsibility (Rice & Dolgin, 2008), whilst also avoiding the lecturing style of an expert, which can bring about resistance to change in YP (Tevyaw & Monti, 2004). However, this finding should be

interpreted with caution as it is plausible that this significant effect was found due to the multiple analyses conducted, therefore increasing the chances of a Type I error. If Bonferroni corrections had been applied for multiple comparisons, this finding would not have been significant. Bonferroni corrections were not applied as this may have resulted in Type II errors, particularly given the small sample size (Armstrong, 2014).

Interestingly, however, there was no evidence of an association between MI partnership skills and viral load. There are a number of plausible explanations for this finding. Firstly, MI is fundamentally focused on eliciting behaviour change. Thus, it would be expected for MI to have a greater effect on behavioural outcomes (e.g. drinking behaviour), than on biological outcomes (e.g. viral load). Indeed, biological outcomes are dependent on a variety of complex factors over and above medication adherence, such as health comorbidities and prescription of specific ART regimens (Lima et al., 2008). It is also tentatively observed that, although non-significant, the p-values are, in general, closer to significance for alcohol consumption outcomes than for viral load. This is in keeping with research identifying a greater impact of MI on substance use than physical health domains (Dunn et al., 2001). Secondly, a significant proportion of participant viral loads at baseline were extremely high, perhaps due to these participants having very recently commenced ART, which introduces the potential for regression to the mean of viral load measurement at time point two (16 weeks post-baseline).

The remaining global MITI scores were not associated with outcomes. The absence of an association between empathy and outcomes is in keeping with some studies in YP (Bertholet et al., 2014; Mastroleo et al., 2013; McCambridge et al., 2011), and inconsistent with others (Borsari et al., 2015; Engle, 2007), including the HIV positive adult literature (Romano & Peters, 2016). These mixed findings suggest that the relationship is still unclear

and future research should aim to clarify this. Cultivating change talk and softening sustain talk are new additions to the latest version of the MITI and their relationship with outcomes for YP have not yet been examined. This finding is somewhat surprising as both client change and sustain talk have been related to outcomes (Magill et al., 2018; Pace et al., 2017), and it would therefore be expected that therapist behaviours facilitating this would also be related to outcomes. The absence of this relationship may be due to the challenges of reliably measuring these dimensions, as they reflect the raters overall impression of these dimensions (Serrano et al., 2018; Moyers et al., 2016). Indeed, it has been argued that these global dimensions would be better represented by behaviour counts to reduce the complexity of measuring this competence (Schmidt et al., 2019).

Behaviour Counts

The absence of a relationship between therapist MI-adherent skills and outcomes is consistent with the literature identified in the previously described systematic review and provides novel MI process evidence for YP living with HIV (Borsari et al., 2019; Caccavale et al., 2018; Gaume et al., 2014; McCambridge et al., 2011; Norberg et al., 2014; Walton et al., 2017). Interestingly, complex reflections and affirmations are the only MI-adherent skills which have been consistently related to client change talk (Apodaca et al., 2016). It is therefore possible that the quality and a precise combination of specific MI-adherent skills are of greater importance than the frequency of their occurrence in sessions. However, the current study used an aggregate measure of these skills to reduce type I errors and could not therefore explore these skills independently. Future research would benefit from focusing on these individual behavioural counts separately.

Conversely, the finding of no association between MI non-adherent skills and outcomes is unexpected. Both the adult literature (Apodaca & Longabaugh, 2009; Romano & Peters, 2016), and recent YP literature (Borsari et al., 2015; Caccavale et al., 2018; Gaume et al., 2014) have identified a consistent relationship between MI non-adherent skills and outcomes. It is possible that no association was found due to the low levels of MI non-adherent behaviours as a result of in-depth training and continued supervision in this study, and therefore a lack of power to detect this.

Summary Scores

The absence of a relationship between the reflections-to-questions ratio score and outcomes is consistent with some of the YP literature (Antony, 2016; McCambridge et al., 2011), but inconsistent with the adult MI literature (Grodensky et al., 2017; Thrasher et al., 2006; Woodin et al., 2012). This tentatively highlights a specific MI skill which may be of less importance for MI with YP in comparison to adults, but further research is required to clarify this. The summary score of percent complex reflections was not associated with outcomes in this study, which is inconsistent with other MI studies with YP (Gaume et al., 2014; McCambridge et al., 2011). Complex reflections communicate a more in-depth understanding of the client's experiences, and as a result, are generally a more challenging MI skill to develop. This is reflected in the current study by the paraprofessionals average rating of 'fair' for this competence.

Exploratory Analysis of Group Differences and MITI variables

Further exploratory analysis revealed that MI skills are unlikely to explain the differences in outcomes across home and clinic delivered MI. Interestingly, this study was

unable to replicate the original RCT finding of significant differences in viral load between participants receiving MI at home or in the clinic, although the results were close to significance. This may be due to the reduced sample size and lack of power, and the impact of selection bias as a result of including only participants with a MITI coded session. Greater reductions in alcohol consumption in participants engaged in MI in a clinic setting was, however, replicated. However, this relationship was found to be independent of MI partnership scores, thus suggesting that this skill is unlikely to explain the differences in outcomes across the two settings. Further explanations for this null finding are described below.

Discussion of Null Findings

Whilst it is possible that a main effect of MI competence was not found as the data included a time point prior to delivery of the MI intervention, the analysis did not reveal expected interactions between time and MI skills. There are numerous explanations for this and the previously identified null findings. Firstly, this study was limited in focus to therapist skills due to the use of the MITI scale. However, there is reasonable evidence to suggest that client change talk mediates the effect of MI on client outcomes (Apodaca et al., 2016; Barnett et al., 2014; Martin et al., 2011; Walker et al., 2011). Indeed, MI sessions are a collaborative interaction between a therapist and client, which would suggest a likely bidirectional and temporal relationship between therapist MI skills and client speech. As such, therapists' use of a particular MI skill in relation to what a client says is vital. Research using sequential analyses (i.e. analysis of whether therapist speech, dependent on client speech and vice versa, is related to outcomes) provides support for this by highlighting the

temporal nature of this relationship (Gaume et al., 2008; Moyers et al., 2007). This has not yet been explored in samples of YP living with HIV.

Another possible explanation for the null findings is that MI may not have been relevant for a large proportion of the study participants. Although no baseline motivation measure was included in the original RCT, over half of the sample had commenced ART within the previous 30 days and baseline levels of alcohol consumption were low. Therefore, it is unlikely that all of the participants were facing motivational barriers to reduce drinking or adhere to medication. MI is fundamentally designed for individuals who are ambivalent about change and is most effective when individuals possess low levels of motivation (Hettema & Hendricks, 2010). This may therefore limit the overall effect of MI in this study and the opportunity for therapist MI skills to be associated with outcomes.

Broadly, the study does not provide support for the technical hypothesis of MI which suggests that therapist MI skills are related to client behaviour change (Miller & Rose, 2009). However, it is also important to consider that models of ART adherence (a causal determinant of viral load) and alcohol consumption highlight the complexity of these behaviours over and above that of shifting individuals' attitudes or motivation towards change, which MI attempts to do. The IMB model suggests a variety of determinants of ART adherence, of which motivation is only one (Fisher et al., 2008). For example, understanding and access to adherence-related information, behavioural skills and additional variables such as mood and substance use are proposed as determinants of adherence. Similarly, models of alcohol consumption also highlight the complexity of factors which determine drinking behaviour including social influence (Lewis et al., 2009), cultural attitudes (Bobo & Husten, 2000), mood and poverty (Kask et al., 2013). This therefore highlights the

complexity of both adherence and drinking behaviours over and above that which is the focus of MI interventions.

Strengths and Limitations

One of the key strengths of this study is the use of MLM as an analytic approach. Using MLM enabled the hierarchical structure of the data to be taken into account and allowed exploration of both between and within participant variability. This analysis approach also allowed use of all data points without resorting to listwise deletion, and therefore avoided possible loss of statistical power.

There are also a number of noteworthy limitations. Firstly, the number of participants with MITI coded sessions was less than half of the original sample. This significantly increased the chances of Type II errors in analysis. It also raises concerns around the representativeness of the subsample, both in relation to the larger sample and broader population of YP living with HIV with problem drinking and adherence. Over half of the sample had commenced ART within the last month and may not therefore be accurately described as facing adherence issues. Additionally, general baseline alcohol consumption levels were low and not suggestive of problem drinking. It is therefore possible that many of the participants were unlikely to benefit from an MI intervention for which they had no need. These limitations may therefore limit the overall external validity of the study.

The limited sample size also impacted the analysis. The model failed to achieve convergence when attempting to randomly vary the slopes at the participant level. This is likely a result of having too many parameters in the model for the number of participants and observations (Bates et al., 2015). Furthermore, it was not possible to include the additional levels of therapists (n=8) delivering MI across different sites (n=5) as level three

factors due to the small sample sizes and additional convergence problems (McNeish & Stapleton, 2016).

The use of the MITI is a further important limitation of the current study. The MITI examines one aspect (therapist skills) of one part of the MI session (20 minute segment) at one time point. When relating this to client outcomes at one year post-MI, it would be expected that any potential effect would be small. Additionally, coding a 20 minute segment is unlikely to be representative of a full MI session in which therapist skills are likely to oscillate with client behaviour (Amrhein et al., 2003; Moyers et al., 2016).

Finally, there are noteworthy measurement error limitations. As a behavioural rating system, the MITI is at risk of rater bias which can distort inter-rater reliability and the overall results (Hoyt, 2002). Research has demonstrated that supervisors will make more positive ratings of MI therapists in comparison to objective raters (Martino et al., 2009). Therefore, MITI scores should be interpreted tentatively, even when inter-rater reliability is within acceptable bounds (Moyers et al., 2014). Additionally, the TLFB measure of alcohol consumption is based on participant self-reporting and it is plausible that demand characteristics and social desirability biases undermined the validity of this measure (Davis et al., 2010). There are also likely unmeasured factors that contribute to both MI competence and outcomes (e.g. the time of day MI was delivered, the experience of MI therapists) that were not accounted for as doing so may have further reduced statistical power.

Implications

Despite the study providing limited evidence for a relationship between MI skills and outcomes for YP living with HIV, the findings highlight that the MI intervention is associated

with positive outcomes and that paraprofessionals are able to deliver MI effectively to YP with HIV. This therefore suggests that task-shifting approaches are potentially viable options within services. Training multidisciplinary team members, such as nurses and community health workers, to use MI partnership skills in consultations may increase the availability of such interventions for hard to reach groups such as YP living with HIV. The current results tentatively suggest that a particular focus on paraprofessionals fostering MI partnership skills may be beneficial for outcomes, although further research is needed to clarify this relationship. Although the current study largely suggests that MI skills are unrelated to outcomes, services could consider the use of more sensitive fidelity tools such as the MISC (Houck et al., 2010) to monitor the quality of MI delivered to YP.

Future research

MI process research in the context of YP living with HIV is in its infancy and future research is therefore crucial to improve knowledge of the mechanisms through which MI produces clinical benefit. The continued use of multi-level modelling has been encouraged as an analytical approach to separate sources of variability (Baldwin et al., 2007). Studies should seek to recruit larger sample sizes of both participants and therapists to enable further exploration of variability at these levels (Soldz, 2006). Experimental manipulation of high and low levels of MI therapist skills across conditions may shed further light on this relationship to outcomes (Moyers et al., 2005b). However, the ethical implications of this should be carefully considered. Incorporating fidelity measures such as the MISC which code both therapist and client utterances and completing sequential analysis of the temporal nature of the communication is suggested as the next logical step to further clarifying the mechanisms of change in MI for YP living with HIV.

Summary

Overall, the findings from this study suggest that paraprofessional MI skills are largely unrelated to viral load or alcohol consumption outcomes for YP living with HIV. Partnership, a skill consistent with the relational hypothesis of MI efficacy, may however, be a particularly important MI skill for therapists engaging with YP living with HIV who are also consumers of alcohol. Furthermore, MI skills are unlikely mediators for differences in outcomes when MI is delivered in the home and clinic settings. This study is the first to provide MI process research evidence for YP living with HIV when MI is delivered by paraprofessional therapists.

Integration, Impact and Dissemination Plan

Integration

The overall aim of the thesis was to investigate the role of MI fidelity in relation to outcomes for YP living with HIV. This was achieved through: (1) a systematic review of the MI fidelity literature across a variety of outcomes in YP, and (2) an empirical study focused specifically on paraprofessionals' fidelity to MI in YP living with HIV. The following section describes the synthesis of these elements of the thesis and provides reflections and critical appraisal on the overall process.

As a result of my initial research project falling through in October 2019, a new project was identified using data from an RCT by the *Healthy Choices* research team. It was agreed that completing a secondary data analysis was a sensible option given the time constraints. *Healthy Choices* is a Motivational Interviewing intervention developed over the last decade by the US team which targets multiple risk behaviours in YP living with HIV. It is the only intervention to date that has demonstrated improvements in both viral load and alcohol consumption in YP with HIV (Murphy et al., 2012; Naar et al., 2009). As previously described, the team's most recent RCT extended the MI intervention for YP living with HIV to home-based settings, with the aim of increasing access to such interventions and sustained outcomes. However, contrary to original hypotheses, YP engaged in clinic delivered MI had greater reductions in viral load and alcohol consumption compared to the YP engaged in home delivered MI. Discussions with the team identified potential research questions for the thesis. It was tentatively hypothesised that this unexpected finding may be, in part, accounted for by MI fidelity, with MI therapists doing 'better' MI in the clinic versus home settings. It was therefore agreed that the thesis would focus on the role of fidelity to MI in the context of outcomes for YP living with HIV.

To further inform the development of the empirical study, the systematic review aimed to synthesise the wider literature on MI fidelity and outcomes for YP. The review therefore provided a comprehensive summary of the relationships between specific MI skills, as measured by MI fidelity measures, and outcomes for YP across a variety of presentations such as diabetes, obesity and substance use. Interestingly, there were no studies identified by the review which explored the relationship between MI skills and outcomes for YP living with HIV. This provided a strong rationale for exploring this process relationship further. Additionally, the review highlighted a lack of MI process studies for YP using paraprofessionals as MI therapists. Taken together, this provided a clear foundation for further empirical exploration of MI fidelity when MI is delivered by paraprofessionals, and the relationship with outcomes for YP, particularly in YP living with HIV. This is in line with calls for tailored interventions that complement the complexities of the lives of YP living with HIV to strengthen their ability and skills to more effectively manage the condition (Idele et al., 2014).

The systematic review also highlighted key areas for exploration in the empirical study. Consistent relationships between specific MI skills and outcomes were identified which were then considered in the analysis plan for the empirical study. The empirical study was therefore able to expand upon the review and provide novel findings for MI process research specific to the population of YP living with HIV who have non-suppressed viral load and consume alcohol.

Reflections on Secondary Data Analysis

Working with secondary data from an independent research team has broadened my knowledge of the unique processes involved in conducting research in this way. The use of secondary data is not only deemed more cost-effective, but also enables research findings to be expedited into knowledge for clinical use (National Institutes of Health, 2003). It also ensures that hard to reach samples and collection of sensitive data is not unnecessarily repeated (Trinh, 2018; Tripathy, 2013). This is particularly important given the scarcity of research in this area for a particularly unique population. Building on an existing data set from an RCT to further enrich the findings felt like an important contribution to the MI process research field.

However, working with secondary data also posed numerous challenges. Firstly, despite having a clear, a priori hypothesis the original data were not collected to specifically answer the research question (Johnston, 2017). As a result, over half of the sample did not have MITI coded sessions. This significantly reduced the available sample size for secondary analysis. Furthermore, of those participants with MITI coded sessions, a number were missing viral load and alcohol consumption data at various time points. This, in part, prompted the use of MLM analysis, as this approach is superior in managing missing data without resorting to listwise deletion, thus maintaining as much data as possible.

Secondly, learning to analyse the data using an MLM approach was significantly challenging. MLM is becoming an increasingly preferred method of statistical analysis to that of repeated measures ANOVA, as it takes into account the nested structure of data (e.g. observations [level 1] nested within clients [level 2]). Despite this, however, it is a statistical approach that is still not widely used within the psychology research field and as such there was limited access to expertise on the specifics of carrying out the analysis. I therefore

attended an MLM statistics course, which enabled me to begin to develop my understanding and skills in carrying out this analysis in SPSS. There are still substantial areas of understanding and skills within this analysis approach that I would like to develop to effectively apply it in my future research work.

Finally, although the study did not require active recruitment, the consideration of ethical issues was still crucial. Participants provided informed consent for their data collected as part of the original study to be used for additional research purposes, and no participant identifiable information was included when the data was shared.

Research Practice Links

Whilst working on the systematic review, I was on a clinical placement in a paediatric health setting. The placement involved both individual psychological therapy and consultation work with the medical team, with a specialist focus on children and YP with diabetes. Interestingly, I came across a number of articles describing the use of MI in these settings, particularly around supporting adherence to the self-management demands of diabetes. This provided a unique opportunity to consider how I could apply the knowledge from my research into my clinical role within an NHS setting. Whilst reflecting on this with my clinical supervisor, it was evident that we as psychologists and the wider medical team could benefit from incorporating more MI communication skills in the interactions that we have with children and YP with diabetes. I was able to provide a teaching session on my thesis, which led to a broader discussion with the wider medical team about implementing MI communication skills in the service.

General Reflections

Despite the challenges of starting a new project with limited time constraints, I am satisfied with the overall integration of both elements of the thesis. The systematic review provides a broad synthesis of the literature on the relationship between MI skills and outcomes for YP, followed by the focused empirical study on this relationship in YP living with HIV. It would have been useful to consult with service providers such as MI trainers or MI therapists in the empirical study to shape the analysis plans and interpretation of the findings based on their direct experience of working with YP in this capacity (National Institute for Health Research, 2018). However, due to time and resource constraints this was not feasible. Despite this, being able to apply the knowledge gained through my research experiences to my clinical practice was an invaluable opportunity, which emphasised the importance to me of our role as scientist practitioners.

Impact

YP aged 10-25 account for 30% of all new HIV infections globally (Khalifa et al., 2019). It is the only age group in which there continues to be a rise in deaths as a result of HIV-related illnesses and subsequently it remains the second leading cause of deaths globally in this age group (UNICEF, 2017). As a result, calls have been made to improve both knowledge and understanding of psychological interventions for YP living with HIV (STOP AIDS, 2016). MI has been demonstrated as an efficacious intervention for improving ART adherence and viral load (Murphy et al., 2012; Naar et al., 2009; Naar et al., under review), and research has further evidenced the feasibility of training paraprofessionals to deliver MI (Naar et al., 2009; Naar et al., under review). However, the quality of MI delivered by paraprofessionals and the relationship to outcomes for YP living with HIV has not been

researched. This thesis therefore investigated the relationship between MI skills, as measured by the MITI scale, and outcomes for YP broadly, with an empirical focus on paraprofessional MI fidelity and the relationship to viral load and alcohol consumption outcomes in YP living with HIV. The overall findings contribute knowledge to MI process research in YP, which remains in its infancy.

Potential Beneficiaries

There are a number of potential beneficiaries of the findings of this thesis including both academic and clinical groups. Clinical beneficiaries include: (1) MI counsellors and MI trainers (2) YP living with HIV, and (3) health professionals working in HIV services with YP. Academic beneficiaries include: (4) researchers and (5) policy makers involved in generating guidelines for YP with HIV. The following section will address each in turn.

MI Trainers and Therapists.

Providing a summary of the systematic review and empirical study findings to MI trainers could provide evidence to support the development of targeted MI training for clinicians working with YP. For example, the systematic review highlighted that greater levels of therapist MI spirit are related to improved outcomes for YP, and the empirical study tentatively suggests that partnership, an element of MI spirit, was associated with reduced alcohol consumption in YP. Trainers could therefore prioritise and emphasise the learning of skills associated with encapsulating the spirit of MI in sessions. Training could also be given to MI supervisors focusing on how supervision sessions can be tailored to continue to promote the specific needs of YP in MI interventions. For example, services may be encouraged to actively monitor MI fidelity using measures such as the MISC, with a

particular focus on the MI skills identified as associated with improved outcomes. MI counsellors themselves will therefore benefit from an improved understanding and knowledge of how to tailor MI sessions for YP, and ultimately supporting them to achieve improved outcomes.

YP Living with HIV.

By disseminating key findings from the review and empirical study to MI trainers and counsellors, YP living with HIV may indirectly benefit from more tailored interventions to the specific needs of this age group. As a result, YP may find it easier to engage with such interventions, thus increasing the possibility of positive outcomes. The benefits of this include reduced risk of opportunistic infection and poor health associated with increased viral load. In addition, if alcohol consumption is targeted in the MI intervention, it is possible that YP will be able to reduce their use of it. As alcohol impacts both directly and indirectly on viral load, through exacerbating poor ART adherence, it is possible that viral load reductions could also be indirectly achieved. Similarly, there is evidence of improvements in mental health outcomes for MI, even when it is not the focus of the intervention (Lundahl et al., 2010). Ultimately, there is a potential double impact on both improving the overall health and wellbeing of YP living with HIV, whilst simultaneously reducing the risk of onward transmission, therefore also having a public health benefit.

Health Professionals Working in HIV.

Clinicians involved in providing HIV services are at the frontline of interacting and communicating with YP living with HIV. Providing a summary of the key findings from both the systematic review and empirical study could benefit clinicians in a number of ways. For

example, health psychology services providing input to HIV clinics working with YP could benefit from an overview of the findings to not only incorporate into their own clinical practice, but to encourage the use of such communication skills by the multidisciplinary team (MDT). Psychologists may be able to use the findings, alongside other evidence, to develop a tailored teaching session to the MDT to support the implementation of this. Encouraging the use of MI communication skills across all clinicians within the team is likely to also benefit YP in terms of outcomes. Services may also find it useful to develop a checklist for frontline clinicians to use in busy clinic settings with examples of specific MI skills which promote partnership and other MI spirit elements. This could be monitored through regular service audits in relation to outcomes for YP.

Researchers.

This thesis highlights that MI process research focused on YP is in its infancy, but particularly within the area of YP living with HIV. It is anticipated that by disseminating the findings of the systematic review and empirical study, researchers will continue to empirically explore MI process relationships and further contribute to the knowledge-base. Experimental manipulation of MI therapist skills and the relationship to outcomes for YP both broadly and in those living with HIV could be further explored to provide more robust evidence. The findings could inform the development of such research in identifying the specific MI skills to use as variables. Researchers may also benefit from the findings in developing more specific competency and fidelity monitoring assessments focused for use in YP populations which incorporate both client and therapist language.

Additionally, as the findings demonstrate that MI skills are unlikely to explain the differences in outcomes across home and clinic delivered MI, future research could focus on

looking at other possible moderators such as route of infection, or confounders such as the time of day that the MI is delivered.

Policy Makers.

The development of guidelines by policy makers is informed by consideration of the evidence base. Guidelines and reports produced by Public Health England are used to inform a variety of stakeholders such as local government, the NHS and the public with evidence-based information. However, significant gaps in the understanding of HIV in YP continue to exist, particularly in relation to appropriate psychological interventions for this group. As a result, information and guidelines for YP living with HIV are often missing from national HIV strategic plans (STOPAIDS, 2016).

A recent UNAIDS report identified specific areas of focus to improve YP treatment targets (UNAIDS, 2019). One of the key identified areas was a requirement to tailor support for ART adherence to the specific needs of YP globally. Providing a summary of the key findings from the thesis may therefore be of benefit to policy makers in increasing the awareness of MI interventions for YP, particularly focused on ART adherence.

In the UK, the British HIV Association Standards of Care for people living with HIV (BHIVA, 2018) highlight the importance of ART adherence support for YP. Interestingly, however, the most recent Public Health England (2019) HIV report makes minimal reference to YP living with HIV. This may reflect the lower rates of YP living with HIV in the UK in comparison to higher rates seen in low to middle-income countries (UNICEF, 2017), however guidance should still be available to this population. Providing an outline of the key findings from this thesis to such groups could help both to improve awareness and inclusion of YP living with

HIV in key policy guidelines and further disseminate key information to important and relevant stakeholders for supporting this population.

Dissemination

To further maximise the impact of the thesis, the dissemination plan covers both traditional routes of academic publication in relevant journals and consultation and sharing of findings with other key stakeholders.

Academic Publication

A key element of the dissemination plan is to submit both the systematic review and empirical study for publication in peer-reviewed journals. It is important to note that the largely non-significant findings of the empirical study may impact the likelihood of publication, due to publication bias (Andrews & Kasy, 2019). Publication bias is problematic as it increases the chances of misrepresentation of intervention effects in systematic reviews, which are frequently used to inform clinical practice guidelines. Publication bias can therefore ultimately impact on clinical practice and patient care (Lensen et al., 2017). It is therefore crucial that the research community as a whole encourages dissemination of non-significant findings, particularly in areas that are in their infancy and for groups such as YP living with HIV with non-suppressed viral load and alcohol consumption.

The *AIDS & Behavior* journal has been identified as a suitable journal for possible publication of the empirical study. The systematic review is likely better suited to the *Journal of Adolescent Health* owing to the broader nature of the conditions included (e.g. diabetes, substance use). Both journals are international and high impact journals reaching

a variety of professions across both clinical and research areas. This strategy will therefore facilitate and broaden the dissemination and impact of the theses.

Sharing Findings with Key Stakeholders

Throughout the research process, contact has been maintained with the US research team from whom the data originated. However, to further facilitate dissemination and future research, it is planned that a summary of the findings and a copy of this thesis will be sent to the team. It is anticipated that this will stimulate discussions for possible future research collaborations.

Furthermore, it is planned that a summary of the key findings will be shared with the clinicians who took part in the original RCT. The summary will be tailored to the clinicians and include highlights from the systematic review which may also be relevant to the healthcare providers working with YP with various health conditions. By sharing the findings with clinicians who were invested in the study, it provides knowledge applicable to their direct clinical work and encourages discussion within services of ways in which they can incorporate some of the findings into their clinical practice. This dissemination approach will be discussed and developed in collaboration with the US team.

Dissemination of the thesis findings to wider audiences have also been considered. It is planned that the following organisations and online platforms will be approached with a summary of the research findings.

The Children's HIV Association (CHIVA).

CHIVA is a UK charity led service providing both online support and direct work with children, YP and their families living with HIV. CHIVA provide up to date information for this

population in an accessible way for both health professionals and children and YP. It also manages a network of professionals involved in providing care for this population, including psychological services. It is anticipated that this particular network would be interested in the findings of the thesis and sharing of this information may stimulate a discussion on how to incorporate elements of the findings into clinical practice.

In addition, the CHIVA website includes a guidance section for healthcare professionals talking to children and YP about HIV in health settings. Guidelines have been developed in collaboration with YP living with HIV specifically for healthcare professionals to support YP with taking ART. Reference is made to the specific language clinicians should use in their discussions around this particular topic. Interestingly, there are no specific guidelines for clinicians discussing alcohol consumption in YP living with HIV. It may therefore be beneficial to provide CHIVA with a summary of the thesis focused on this area. This could be achieved through a collaboration with CHIVA and their service-user board of YP living with HIV to develop guidelines specifically on MI communication skills for healthcare professionals to address problem alcohol consumption in YP living with HIV.

AidsMap.

AidsMap is a charity website which focuses purely on providing up to date and accurate information on HIV. It is developed for both YP and adults with HIV, and professionals working within HIV services. The website includes a dedicated blog page and news bulletin which includes information on the latest research and information on HIV prevention and treatment. Providing a summary of the key findings via this route would enable quick and easily accessible dissemination of the research to a wider audience. It may

be beneficial to a variety of healthcare professionals, including those working directly in HIV, and researchers.

Motivational Interviewing Network of Trainers (MINT).

MINT is an international organisation of MI trainers committed to promoting evidence based practice, research and training in MI. Providing the organisation with a summary of the key findings may stimulate a wider discussion around ways to adapt specific training sessions for MI with YP. Information may be provided regarding particular MI skills associated with YP outcomes as demonstrated by the systematic review and empirical study. It would also be useful for MI trainers to highlight the importance of using MI fidelity measures to MI trainees, particularly if the services are paraprofessionals delivering MI.

Evidencing Impact

It is anticipated that effective dissemination of the thesis will encourage HIV services to consider training of paraprofessionals in MI to increase the availability of such interventions for YP living with HIV. Furthermore, it is hoped that academic dissemination will prompt further process research of the efficacy of MI for YP both with HIV and other health conditions. Doing so will ultimately improve our understanding of the elements of MI which bring about clinical benefit for this population, therefore informing the tailoring of appropriate interventions for YP living with HIV. To demonstrate whether these aims have been achieved, evaluating and evidencing the impact is important.

It would be useful to collect anonymous feedback from the therapists involved in the original study to further inform the interpretation of the findings. In particular, it would be of benefit to ask whether the therapists are continuing to use the MI skills they were trained in

for the study, and whether they have noticed any improvements in outcomes for YP as a result. Indeed, research has identified that MI skills can be maintained by paraprofessional MI therapists over time (Evangeli et al., 2011). In addition, it would be useful to know whether the sites involved in the original study have continued to maintain the use of the MITI in supervision sessions, and to get their specific feedback on this fidelity measure.

To evidence the impact of dissemination via online platforms, a link could be included for a short online survey. Specific questions around whether the reader found the information relevant, accessible and useful would be included.

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Appendices

Appendix 1: Royal Holloway University of London Research Ethics Committee Approval

PI: Dr Michael Evangeli

Project title: Motivational Interviewing (MI) fidelity and health outcomes for youth living with HIV

REC ProjectID: 1895

Your application has been approved by the Research Ethics Committee.

Please report any subsequent changes that affect the ethics of the project to the University Research Ethics Committee ethics@rhul.ac.uk

**Appendix 2: Royal Holloway University of London Research Sub-Committee and Course
Executive Approval**

Memorandum

To: Laurie Josephs
From: Gary Brown (on behalf of the Research Sub-Committee and
Programme Executive)
Date: 22nd November 2019
Copy To: Michael Evangeli
Re: Main Research Project Proposal

The Research Sub-Committee has considered your Main Research Project Proposal and has decided to give you **Approval**.

Your research costs have also been approved. Please note that if these costs change and you do not re-submit an amended form for approval prior to incurring any additional costs, these additional costs will not be reimbursed.

Appendix 3: Motivational Interviewing Treatment Integrity (MITI) Code

Revised December 2014

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Recording #: _____ Coder: _____ Date: ___/___/___

Global Ratings

Technical Components					
Cultivating Change Talk	1	2	3	4	5
Softening Sustain Talk	1	2	3	4	5
Relational Components					
Partnership	1	2	3	4	5
Empathy	1	2	3	4	5

Target Change: _____

Behavior Counts

	Total	
Giving Information (GI)		
Persuade (Persuade)		
Persuade with Permission (Persuade with)		
Question (Q)		
Simple Reflection (SR)		
Complex Reflection (CR)		
Affirm (AF)		
Seeking Collaboration (Seek)		
Emphasizing Autonomy (Emphasize)		
Confront (Confront)		

Start time and sentence: _____

End time and sentence: _____

Amphetamine type stimulants (speed, diet pills, ecstasy, etc.)
Inhalants (nitrous, glue, petrol, paint thinner, etc.)
Sedatives or Sleeping Pills (Valium, Serepax, Rohypnol, etc.)
Hallucinogens (LSD, acid, mushrooms, PCP, Special K, etc.)
Opioids (heroin, morphine, methadone, codeine, etc.)
Other

3. How much (name substance) did you use on this day?
4. Where did you get or buy (name substance) on this day?
5. How much money did you spend on (name substance) on this day? (round to nearest whole US dollar)

\$ | | | | |

6. When did you last use drugs or alcohol before that?

| | | | | | | | | | | | | | | | | | | | | |

Did not use drugs or alcohol before that in the last 30 days (0)

7. What was the greatest amount of alcohol you consumed on any given day during this period?

| | | | | drinks

181a. Do you recall when this occurred?

| | | | | | | | | | | | | | | | | | | | | |

8. What was the least amount of drinking during this period?

| | | | | drinks

182a. When did it occur?

| | | | | | | | | | | | | | | | | | | | | |

9. As I mentioned earlier, some people have patterns to their drinking that can help them recall their use. Do you have any notable patterns to your drinking?

10. What was the greatest amount you used on any given day during this period?

| | | | |

184a. Do you recall when this occurred?

| | | | | | | | | | | | | | | | | | | | | |

11. What was the least amount of drugs you used during this period and when did it occur?

12. As I mentioned earlier, some people have patterns to their drug use that can help them recall their use. Do you have any notable patterns to your drug use?