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Associations of psychological inflexibility with posttraumatic stress disorder and adherence to COVID-19 control measures among refugees in Uganda: The moderating role of coping strategies

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ABSTRACT

Refugees are vulnerable to developing mental health problems. The unprecedented appearance and rapid spread of COVID-19 exacerbated this vulnerability, especially in low-income countries where refugees survive on humanitarian aid and live in congested settlements. These appalling living conditions are a stressor, making adherence to COVID-19 control measures impractical and an additional psychological strain for refugees. The present study examined how psychological inflexibility is associated with adherence to COVID-19 control measures. A sample of 352 refugees from Kampala City and Bidibidi settlements were recruited. Refugees with high levels of psychological inflexibility reported higher PTSD symptom severity and low adherence to COVID-19 control measures. Moreover, PTSD severity mediated the association between psychological inflexibility and adherence, while avoidance coping moderated both direct and indirect effects. Interventions for reducing psychological inflexibility and avoidance coping may be essential in boosting adherence to measures relevant to the current and future status of the pandemic, along with other crises that refugees face.

The spread of the novel coronavirus (COVID-19) was rapid, grossly altering ways of life across the globe in a short time (Dawson & Golijani-Moghaddam, 2020). Lifestyle adjustments such as self-quarantine, frequent hand washing, social distancing, and masking were introduced as control measures; however, these complicated life in several settings. (World Health Organization, 2021). These control measures were accompanied by economic lockdowns and curfews as enforcement mechanisms for restricting physical, interpersonal contact. Although these measures were remarkable in containing the spread of COVID-19, their uptake and sustainability in refugee settlements in Uganda were questionable (Alemi et al., 2020).

The lifestyle adjustments introduced by the COVID-19 behavioral control measures did not consider refugee settlements' social and economic realities. First, Uganda hosts over 1.59 million refugees and asylum seekers (United Nations Higher Commissioner for Refugees [UNHCR], 2022) who mostly live in congested settlements and makeshift houses (Alemi et al., 2020; Barua & Karia, 2020). Second, refugees in Uganda are highly mobile, resulting in a higher risk of contracting COVID-19 and subsequently being perceived as transmitters of COVID-19 (Bukuluki et al., 2020). Unsurprisingly, stigmatization and xenophobia against refugee and migrant populations were widespread (Lantz & Wenger, 2022; Wang et al., 2021). Third, refugees survive mostly on humanitarian support, supplemented with income from small-scale business activities and casual jobs (Baluku et al., 2021; Bukuluki et al., 2020), which were grossly affected by the economic lockdowns. Consequently, the risk of malnutrition was reported to be very high (Integrated Food Security Phase Classification Global Platform, 2021). The aforementioned reasons altogether made adherence COVID-19 prevention measures difficult and distressing (Alemi et al., 2020; Leter & Gatwal, 2020).

The present study investigates whether posttraumatic stress disorder (PTSD) symptoms associated with COVID-19-related distress during the early stages of the pandemic affected adherence to the control measures, with a focus on psychological inflexibility and coping strategies as potential interacting antecedents. In the International Classification of Diseases 10th Revision (ICD-10), PTSD "arises as a delayed or protracted

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response to a stressful event or situation (of either brief or long duration) of an exceptionally threatening or catastrophic nature, which is likely to cause pervasive distress in almost anyone" (World Health Organisation [WHO, 1992: 309). PTSD symptoms may include persistent remembering or reliving of the stressor, avoidance of circumstances resembling the stressor, inability to remember important aspects of the period of exposure, and symptoms of increased physiological sensitivity and arousal (WHO, 1992). The unprecedented appearance, magnitude, and methods used to control COVID-19 suggest that it is likely a traumatic stressor (Bridgland et al., 2021; Miller, 2020).

Psychological attributes can be coping resources or as predisposing factors for the development of mental health concerns (Y. C. Shen et al., 2017). We particularly focus on psychological inflexibility, a vulnerability factor for psychological disorders (Levin et al., 2013; Paulus et al., 2016; Tanhan, 2019). Psychological inflexibility is a higher order constructs that refers to the "rigid dominance of psychological reactions, over chosen values and contingencies, in guiding action" (Bond et al., 2011, p. 678). Research shows psychological inflexibility is associated with PTSD symptom severity (e.g., Meyer et al., 2019; Schramm et al., 2020). The positive association between psychological inflexibility and the severity of PTSD symptoms spans across contexts and populations including military veterans (e.g., Cheng et al., 2021; Kachadourian et al., 2021; Meyer et al., 2019), patients and caregivers (e.g., Janssen et al., 2022; Lappalainen et al., 2021), and refugees (e.g., Gray et al., 2021). Psychological inflexibility and PTSD symptoms have also shown a strong relationship during the COVID-19 pandemic (e.g., Hernández-López et al., 2021; Pakenham et al., 2020; Smith et al., 2020). Moreover, a reduction in psychological inflexibility tends to result in improvement in PTSD symptoms (Schramm et al., 2020). However, few studies have applied psychological inflexibility to understanding PTSD and psychological problems in the diverse contexts of various refugee populations worldwide. The current research focuses on refugees in a low-income country during the COVID-19 pandemic.

Research on psychological inflexibility suggests that individuals may use forms of experiential avoidance as maladaptive coping strategies, increasing vulnerability to several mental health problems (S. C. Hayes et al., 2006; Kato, 2016). Coping strategies refer to an individual's cognitive and behavioral efforts to minimize, tolerate, or master stressful events (Donnellan et al., 2006). Extant literature indicates that psychological inflexibility and coping strategies predicted PTSD symptoms during COVID-19 (Bruno et al., 2022; Gray et al., 2021), including among refugee populations (Gray et al., 2021), consequently inhibiting refugees' adherence to COVID-19 preventive measures. Adherence is defined as whether individuals could adaptively change and embrace behavioral restrictions such as wearing face masks, washing hands frequently, and staying home. Extant literature suggests that flexibility facilitates positive behavior change while inflexibility represents rigidity in behavioral adjustment (Rueda & Valls, 2020) enabled through experiential avoidance mechanisms (Bruno et al., 2022; Levin et al., 2013; Shepherd et al., 2022).

It could be assumed that the possibilities of conceptual overlap influences the strong association between psychological inflexibility and PTSD. Meyer et al. (2019) address the conceptual overlaps between the avoidance aspects of PTSD and in psychological inflexibility, highlighting extant empirical findings that suggest psychological inflexibility is related to PTSD symptom severity even after controlling for the avoidance cluster. In the present study, we show that PTSD symptoms could be determined by psychological inflexibility and act as a mediator for the relationship between psychological inflexibility and behavior adjustment (i.e., adherence to COVID-19 prevention measures). Psychological flexibility is expected to facilitate movement toward desired behavior and quality of life, while inflexibility inhibits behavior adaptability, negatively affecting psychological health (S. C. Hayes et al., 2006, 2012; Tanhan, 2019). Similarly, PTSD is known to impair individuals' functioning (Hoge et al., 2007; Meyer et al., 2019) and behavioral adjustment (Grandgirard et al., 2002), as well as lead to behavior problems (A. C. T. Shen, 2009). Thus, it is possible that PTSD symptoms may be a possible mediating link between psychological inflexibility and adherence levels.

We also propose that the effects of psychological inflexibility on adherence to COVID-19 prevention measures, as well as the indirect effects via PTSD, are moderated by coping strategies. Coping strategies concern how individuals respond to challenges at a given time (Scorsolini-Comin et al., 2021). We specifically classify coping strategies as either avoidance coping (e.g., disengagement, which involves evading the threat and related emotions) or approach coping (e.g., engagement, which involves dealing with the problem and associated emotions) (Carver & Connor-Smith, 2010; Scorsolini-Comin et al., 2021; Skinner et al., 2003). Coping is essential when experiencing PTSD symptoms (Ahmad et al., 2020; Pietrzak et al., 2011) and practicing COVID-19 adherence (Lynggaard et al., 2017; Zullig et al., 2013). Approach coping targets the problem, while avoidance is largely maladaptive and does not target the threat (Roth & Cohen, 1986; Scorsolini-Comin et al., 2021), increasing the risk of mental health problems and maladaptive behaviors. Hence, approach coping is associated with fewer or more mild symptoms, while avoidant coping is associated with more severe symptoms of depression and PTSD (Badour et al., 2012; Hassija et al., 2012; Herman-Stabl et al., 1995). In this direction, coping strategies have been found to moderate the association between resilience variables and PTSD symptoms (Hooberman et al., 2010) and adherence behavior (Martinez et al., 2012). In sum, avoidant coping is likely to exacerbate symptoms while approach coping could buffer against the impact of psychological inflexibility on PTSD symptoms and the subsequent adverse impact on adherence.

Based on this literature, we hypothesized that psychological inflexibility would be negatively related to adherence to COVID-19 control measures (H1) but positively associated with PTSD symptom severity (H2a). Additionally, we hypothesized that PTSD symptom severity would be related negatively to adherence to COVID-19 control measures (H2b) and would mediate the effects of psychological inflexibility on adherence to COVID-19 measures (H2c). Concerning the role of coping strategies, we hypothesized that avoidance coping would be positively related to PTSD symptom severity (H3a) and negatively associated with adherence to COVID-19 control measures (H3b). We also hypothesized that approach coping would be negatively associated with PTSD symptom severity (H4a) and positively related to adherence to COVID-19 control measures (H4b). Moreover, hypothesis 5a stipulates that avoidance coping would be likely to strengthen the positive effects of psychological inflexibility on PTSD symptom severity and the negative effects of psychological inflexibility on adherence to COVID-19 preventive measures (H5b). Lastly, we hypothesized that approach coping would be likely to weaken the positive effects of psychological inflexibility on PTSD symptom severity (H6a) and weaken the negative effects of psychological inflexibility on adherence to COVID-19 preventive measures (H6b).

1. Methods

1.1. Participants and procedure

To test our hypotheses, we conducted a field survey among refugees in two refugee settlements in Uganda with varying sociocultural contexts. First was the Bidibidi settlement (rural context), which is the world's second-largest refugee settlement hosting over 270,000 refugees (Bukuluki et al., 2021) and is home to mainly South Sudanese Refugees. The second was the Kampala metropolitan area (including Kampala, Mukono, and Wakiso districts), hosting over 80,000 urban refugees. These variations were considered necessary in the context of COVID-19 given the differences in living conditions. The implementation of COVID-19 preventive measures and the restriction of movement and economic activities were likely to disproportionately affect these two groups of refugees. Refugees in rural settlements have access to land and

humanitarian aid, albeit inadequate. Conversely, refugees living in towns outside the refugee settlements must take care of their survival needs (Bukuluki et al., 2020) primarily through entrepreneurial activities, which have also been grossly affected by COVID-19.

We collected the data between the first and second lockdowns, when the economy was partially opened (May and July 2020). A paper and pencil method was used, yielding 387 responses. We enrolled individuals who were 18 years and above. Written informed consent were obtained from all participants willing to respond to the survey questionnaire. Consent forms were provided in the participant's preferred language (English or Somali). Only 352 (74.4% males; 57.1% from the rural settlement in Bidibidi) were complete responses. The sample comprised mainly young refugees ($M = 29.74$ years, $SD = 8.57$, range = 18 – 70 years) with an average stay in Uganda of 4.63 years ($SD = 4.63$, range = 1 – 25 years). Regarding education status, 75.9% reported having at least attended secondary or tertiary education.

1.2. Measures

The survey questionnaire was administered in English and Somali to allow refugees from different countries to participate. The English version was administered mainly to South Sudanese refugees and the Somali version was administered to Somalis refugees. Although we also offered an Arabic version, the South Sudanese refugees preferred the English version. Quality of translation was ensured by using back translation following procedures from Brislin (1970). A Native Somali translated the items from English to Somali. Two other native Somali speakers back-translated the Somali version to English. The three experts worked together to remove any discrepancies, arriving at the final version that was administered to participants. A 6-point Likert scale was used for all the measures. Fifty-three participants used the Somali version, while 299 used the English version of the questionnaire.

1.2.1. Psychological inflexibility

We used the Avoidance and Action Questionnaire (AAQ) (Bond et al., 2011). The AAQ is the most widely used psychological inflexibility measure, focusing on rigidity in handling unpleasant internal events (Bonilla-Sierra et al., 2021). The questionnaire comprises seven items that were rated on a 6-point scale ranging from 1 (*not at all*) to 6 (*very much*). A sample item is "I worry about not being able to control my worries and feelings." We found appropriate reliability for the questionnaire in the present study ($\alpha = .77$; .74 for English and .91 for Somali versions).

1.2.2. Posttraumatic stress disorder (PTSD) symptoms

We used the revised Impact of Events Scale "IES-R" (Weiss, 2007). The scale comprises 22 items assessed on a 6-point scale ranging from 1 (*never*) to 6 (*very often*). Average item scores were used, with a high score indicating more severe PTSD symptomology. Instructions were adapted to the COVID-19 context: "Below is a list of difficulties people experience after stressful events. Kindly indicate how distressing each difficulty has been for you during the past week concerning the COVID-19 pandemic." A sample item is "I had trouble staying asleep." The scale had appropriate consistency ($\alpha = .80$; .79 for the English version and .96 for the Somali version). Previous assessments of the scale have found good psychometric properties that are fit for clinical and research purposes (e.g., Beck et al., 2008).

1.2.3. Coping dtrategies

We used the Brief COPE to measure coping strategies (Carver, 1997). This 28-item self-report scale measures individuals' coping styles in response to stressful experiences. Our exploratory factor analysis supported two factors, including avoidant and approach coping (Dawson & Golijani-Moghaddam, 2020; Eisenberg et al., 2012). Avoidant coping is comprised of self-distraction, denial, substance use, behavioral disengagement, venting, and self-blaming. In contrast, approach coping included active coping, emotional and instrumental support, positive reframing, planning, and passive acceptance. Items were rated on a 6-point scale ranging from 1 (*not at all*) to 6 (*a lot*). Instructions were adapted to the COVID-19 context: "Indicate the degree to which you have engaged in each of the following behaviors since the outbreak of COVID-19." A sample item for avoidant coping is "I've been using alcohol or other drugs to help me get through it." A sample item for approach coping is "I've been concentrating my efforts on doing something about the situation I'm in." Average scores for avoidant and approach coping were used, with higher score indicating more of the respective coping strategy. The Brief COPE is widely used in different situations and has good psychometric properties (Carver, 1997; Dawson & Golijani-Moghaddam, 2020). In the current study, appropriate internal consistency was observed for both avoidant coping ($\alpha = .70$; .68 for the English version and .80 for the Somali version) and approach coping ($\alpha = .74$; .75 for the English version and .76 for the Somali version).

1.2.4. Adherence to COVID-19 control measures

We asked participants questions about their adherence to the COVID-19 control measures from the World Health Organization (WHO) and the government of Uganda. The control measures examined were frequent handwashing with soap, using sanitizers, wearing face masks, social distancing, and self-isolation (see Appendix 1). The measure was developed following the structure of the medical adherence questionnaire (Morisky et al., 2008). The questionnaire addressed several behaviors, including frequency of forgetting to adhere to the control measures, difficulty in remembering to use the control measures, frequency of non-adherence to the measures in the past two weeks, feeling inconvenienced by the measures, and relaxing observance of control measures when COVID-19 was perceived to be under control.

Different anchors were used in obtaining the extent of adherence or non-adherence. First, participants were asked, "How often do you forget …." (e.g., to wear a face mask). Second, participants were asked, "In the past two weeks, were there days when you did not …" (e.g., maintain a distance of at least two meters from people who don't belong to your household). Third, participants were asked, "When you travel or leave home, do you sometimes forget to …" (e.g., carry your hand sanitizer). Fourth, participants were asked, "How often do you have difficulty remembering…" (e.g., to wash or sanitize your hands). Fifth, participants were asked how often they felt inconvenienced by the measures (e.g., cleaning yourself and clothing immediately after you return home). Lastly, participants were asked whether they changed behavior when COVID-19 seemed under control: "When you feel like COVID-19 is under control or not a real threat, do you sometimes stop …" (e.g., maintaining a distance of at least two meters from people who don't belong to your household). All items were rated on a 6-point scale ranging from 1 (*never*) to 6 (*very often*). The questionnaire had appropriate internal consistency ($\alpha = .90$; .79 for the English and .95 for the Somali versions).

2.1. Analytic strategy

We utilized a moderated mediation for the effects of psychological inflexibility on adherence to COVID-19 control measures via PTSD symptom severity and conditioned by coping strategies. We used moderated mediation analysis in PROCESS Macro for SPSS v3.4 model 8 (A. F. Hayes, 2018), which tests for the mediation and moderation effects simultaneously. Basic demographic characteristics, including age, gender (sex), type of settlement, and education, are determinants of differences in mental health outcomes (Cheng et al., 2021; Galatzer-Levy et al., 2013) and also determinants of COVID-19-related behaviors such as uptake of COVID vaccines (Shiloh et al., 2022). Therefore, we controlled for the effects of these variables in our regression models because they are potential confounding factors.

Based on the G-power v3.1 (Erdfelder et al., 2009) sample size calculator, the minimum sample recommended for the regression analysis model with seven predictor variables, an anticipated effect size of

0.15, desired probability level of 0.01, and desired statistical power of 0.99 is 253. Therefore, our sample size is considered adequate to achieve statistically satisfactory effect sizes. Bootstrapping at 10,000 with confidence intervals at 95% were applied to help generate an empirically derived representation of the sampling distribution of the indirect effect in mediation analysis (A. F. Hayes, 2018). Two models were run, one with avoidant coping strategies as the moderator, and the other with approach coping. A multicollinearity test was performed because both psychological inflexibility and avoidance coping involve avoidance behaviors. The Variance Inflation Factor (VIF) ranged from 1.09 to 1.68, and tolerance values ranged from .59 to .91, indicating that multicollinearity was not a concern for the present study (O'Brien, 2007; Thompson et al., 2017).see. Fig. 1, Fig. 4

3. Results

The means, standard deviations, alpha coefficients, and correlations are presented in Table 1. Correlations among all variables were significant. Sex, type of settlement (urban or rural), and level of education were significantly correlated to all the study variables. Most notably, the level of education was positively correlated to adherence. The correlations further suggest that refugees who are females and in urban areas were more likely to adhere to COVID-19 preventive measures. Tables 2 and 3 show the moderated mediation effects of psychological inflexibility on adherence to COVID-19 control measures, with avoidance and approach coping strategies as the moderators.

As predicted, findings in Table 2 show that psychological inflexibility was related negatively to adherence (B = -.51, $p < .001$) and positively to PTSD symptom severity (B = .59, $p < .001$), while PTSD symptom severity was negatively related to adherence (B = -.25, $p < .001$). Similar findings can be observed in Table 3; hypotheses 1, 2a, and 2b are thereby confirmed. Hypothesis 2c suggested that PTSD symptom severity mediates the effects of psychological inflexibility on adherence. The significant conditional indirect effects for regression models in Tables 2 and 3 support this proposition. Sobel test for the regression model in Table 2 (z = -2.47, SE = .06, p = .014) and for the regression model in Table 3 (z = -3.68, SE = .08, $p < .001$) confirm the mediation effects.

We hypothesized a moderated mediation such that psychological inflexibility's direct and indirect effects on adherence to COVID-19 preventive measures are conditioned on avoidance and approach coping strategies. As expected (hypothesis 3a), avoidance coping was positively related to PTSD symptom severity (B = .68, $p < .001$) and negatively associated with adherence (B = -.43, $p < .01$). Surprisingly, approach coping was also positively related to PTSD symptom severity (B = .44, $p < .001$) but not associated with adherence. Therefore, hypotheses 3a, 3b, and 4a were confirmed, but hypothesis 4b was not supported. Overall, the hypothesized moderated mediation model was supported when avoidance coping was the moderator (*index of moderated mediation* = .004, CI = <.001 - .01) but not when approach coping was the moderator.

Specifically, in the regression model in Table 2, avoidant coping moderated the effects of psychological inflexibility on PTSD symptom severity (B = -.02, $p < .05$) as well as on adherence (B = -.04, $p < .001$). As seen from the plots in Fig. 2, psychological inflexibility was associated with higher PTSD symptom severity scores for individuals with stronger usage of avoidance coping. Hypothesis 5a was therefore supported. Similarly, avoidant coping strengthened the negative effects of psychological inflexibility on adherence because adherence tended to be low for individuals with stronger usage of avoidance coping and high levels of inflexibility (see plots in Fig. 3 and the conditional effects in Table 2). Therefore, hypothesis 5b was also supported. In the regression model in Table 3, approach coping moderated the effects of psychological inflexibility on adherence (B = -04, $p < .001$) but not on PTSD symptom severity, indicating that approach coping did not necessarily weaken the positive effects of psychological inflexibility on PTSD symptom severity. Thus, hypothesis 6a was not supported. Although significant interaction effects were observed for adherence (supporting hypothesis 6b), the interaction plots in Fig. 5 show that adherence was relatively low for individuals with stronger usage of approach coping strategy at high levels of psychological inflexibility.

4. Discussion

In this study, we examined how psychological inflexibility was related to adherence to COVID-19 control measures in the context of refugees in a low-income country. Specifically, we explored a potential moderated mediation model suggesting that psychological inflexibility thwarted adherence among refugees via PTSD symptom severity and that an individual's coping strategy moderates the direct and indirect effects of psychological inflexibility.

Consistent with hypothesis 1, results showed that psychological inflexibility was negatively associated with adherence to COVID-19 control measures, suggesting that refugees with high levels of psychological inflexibility were likely to report lower levels of adherence to COVID-19 control measures. This finding is in line with the theoretical expectations and extant evidence suggesting that psychological flexibility inhibits behavior change or regulation (Daks et al., 2020; S. C. Hayes et al., 2006) which could be especially detrimental in situations that require behavioral adjustment. These results suggest that, in further handling of the pandemic (and/or similar crises), efforts should be geared towards reducing psychological inflexibility and increasing psychological flexibility in order to promote acceptability and uptake of vaccination, as one example. However, in a related study, psychological flexibility did not significantly predict adherence to COVID-19-related restrictions (Dawson & Golijani-Moghaddam, 2020), which may suggest additional attention to the context and the level of perceived threat is needed.

Consistent with hypothesis 2a, the results confirmed that

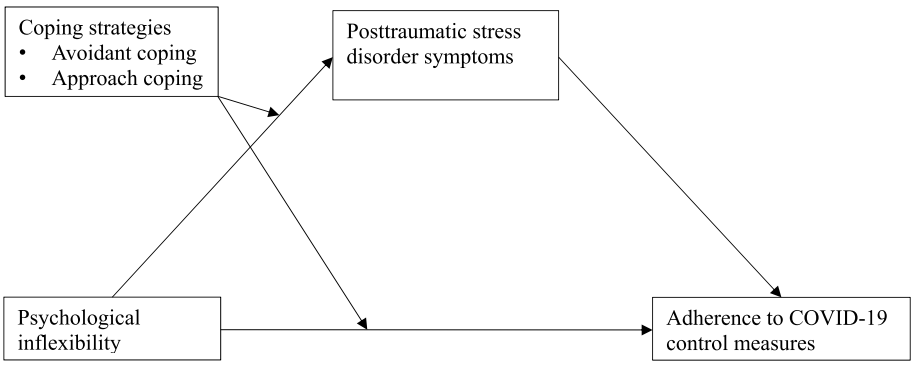

Fig. 1. Conceptual model depicting the hypothesized direct, indirect, and conditional effects of psychological inflexibility on adherence to COVID-19 preventive measures

Table 1
Descriptive statistics and correlations among study variables

	1	2	3	4	5	6	7	8	9
1 Sex[a]	-								
2 Age	.01	-							
3 Type of settlement[b]	-.18**	.09	-						
4 Level of education[c]	.33***	.03	-.27***	-					
5 Psychological inflexibility	-.09	.04	.12*	-.13*	-				
6 Avoidance coping	-.17**	.05	.24***	-.24***	.52***	-			
7 Approach coping	-.17**	.02	.26***	-.14*	.14**	.29***	-		
8 PTSD symptoms	-.25***	.07	.22***	-.16**	.48***	.53***	.36***	-	
9 Adherence	.13*	-.04	-.13*	.16**	-.37***	-.43***	-.16***	-.38***	-
Mean		29.74			25.16	41.18	50.45	73.30	74.19
Standard Deviation		8.57			10.00	12.39	12.53	21.89	29.99
Cronbach's α					.78	.70	.75	.85	.92
Minimum					7	12	12	22	23
Maximum					42	72	72	126	138

*p < 0.05, **p < 0.01, ***p < 0.001; N = 353;
[a] Male = 1, Female = 2;
[b] Urban = 1, Rural = 2;
[c] Elementary/ primary school = 0, Level of education, Secondary school = 1, Tertiary and university = 3

Table 2
Moderated and mediated effects with avoidant coping as the moderator

Predictors	PTSD				Adherence			
	B	*SE*	*CI*		*B*	*SE*	*CI*	
			(LLCI,	*ULCI)*			*(LLCI,*	*ULCI)*
Sex[a]	-7.95***	2.28	(-12.43,	-3.47)	1.52	3.48	(-5.33,	8.35)
Age	.10	.11	(-.12,	.31)	-.03	.16	(-.35,	.30)
Settlement [b]	3.28	2.00	(-.66,	7.21)	-.71	3.02	(-6.64,	5.23)
Educational level	.87	1.57	(-2.21,	3.94)	1.89	2.35	(-2.74,	6.51)
Psychological inflexibility (PI)	.59***	.11	(.38,	.80)	-.51**	.17	(-.84,	-.17)
Avoidant coping (AC)	.68***	.10	(.49,	.87)	-.43**	.16	(-.74,	-.13)
PTSD					-.25**	.09	(-.41,	-.09)
Interaction effects	-.02*	.01	(-.03,	-.002)	-.04***	.01	(-.06,	-.02)
Model summary	R^2 = .38, F(7, 344) = 30.68***				R^2 = .26, F(8, 343) = 15.27***			
ΔR^2	ΔR^2 = .01, F(1, 344) = 5.38*				ΔR^2 = .02, F(1, 344) = 11.22***			
Conditional direct effects at values of AC								
-1SD	.80***	.13	(.53,	1.06)	-.06	.21	(-.47,	.36)
Mean	.59***	.11	(.38,	.80)	-.51**	.17	(-.84,	-.17)
+1SD	.38**	.15	(.09,	.67)	-.96***	.23	(-1.40,	-.52)
Conditional indirect effects at values of AC								
-1SD					-.20[s]	.08	(-.37,	-.05)
Mean					-.15[s]	.06	(-.28,	-.04)
+1SD					-.09[s]	.05	(-.22,	-.01)
Index of moderated mediation					.004[s]	.002	(<.001,	.01)

*p < 0.05, **p < 0.01, ***p < 0.001; N = 353;
[c]Elementary/ primary school = 0, Level of education, Secondary school = 1, Tertiary and university = 3
[a] Male = 1, Female = 2;
[b] Urban = 1, Rural = 2
[s] Significant effects,[n.s]Not signiticant

psychological inflexibility was positively associated with PTSD symptom severity. High levels of inflexibility are likely to amplify manifestations of PTSD symptoms, which is consistent with previous research findings (e.g., Cheng et al., 2021; Meyer et al., 2019; Schramm et al., 2020). Refugees who have already been exposed to traumatic events are more likely to experience heightened PTSD symptoms severity when further faced with stressful situations. This exacerbation is even more likely when an individual has high levels of psychological inflexibility. Inflexibility is characterized by limited behavioral repertoire and rigidity in behavioral reactions (Bond et al., 2011; Tanhan, 2019; Uğur et al., 2021), making it difficult to adjust to the requirements of a given situation, setting a precedence for psychological distress and dysfunction. Consequently, consistent with hypotheses 2b and 2c, PTSD symptom severity was negatively associated with adherence and acted as a mediator between psychological inflexibility and adherence levels. Therefore, refugees with high levels of psychological inflexibility were more likely to have experienced severe symptoms of PTSD, which negatively influenced behavioral adjustment in observing the COVID-19 control measures.

Our findings also have clinical implications. We found that PTSD symptom severity was negatively associated with adherence to COVID-19 prevention measures among refugees in Uganda. Therefore, psychosocial services to reduce trauma among refugees could help in behavioral adjustment. This could also be essential to other tasks and processes they have to undertake, such as the acculturation process. Moreover, beyond COVID-19, refugee populations are vulnerable to developing PTSD symptoms and other mental health problems (Chan et al., 2016; Leiler et al., 2019). With the added vulnerability resulting from the experiences of the COVID-19 pandemic, there is an urgent need to develop assessment and treatment protocols for traumatized refugees, as untreated trauma can breed further behavioral challenges. For example, there is evidence that refugees experienced financial

Table 3
Moderated and mediated effects with approach coping as the moderator

Predictors	PTSD				Adherence			
	B	SE	CI		B	SE	CI	
			(LLCI,	ULCI)			(LLCI,	ULCI)
Constant	4.07***	.27	(3.53,	4.61)	4.05***	.46	(3.16,	4.95)
Sex[a]	-.36**	.11	(-.58,	-.14)	.21	.15	(-.08,	.49)
Age	.004	.01	(-.01,	.02)	.002	.01	(-.01,	.02)
Years lived in Uganda	-.01	.01	(-.04,	.01)	-.01	.02	(-.05,	.02)
Settlement [b]	.08	.10	(-.11,	.28)	-.09	.13	(-.35,	.17)
Psychological inflexibility (PI)	.30***	.04	(.23,	.36)	-.19***	.05	(-.29,	-.10)
Approach coping (AC)	.25***	.05	(.15,	.34)	-.06	.07	(-.18,	.07)
PTSD					-.30***	.07	(-.44,	-.17)
Interaction effects	-.02	.03	(-.05,	.08)	-.10*	.04	(-.18,	-.02)
Model summary	R^2 = .29, F(7, 345) = 20.66***				R^2 = .22, F(8, 344) = 11.76***			
ΔR^2	ΔR^2 = <.001, F(1, 345) = .31				ΔR^2 = .01, F(1, 344) = 5.63*			
Conditional direct effects at values of AC								
-1SD	.28***	.05	(.17,	.38)	-.09	.07	(-.23,	.05)
Mean	.30***	.04	(.23,	.36)	-.19***	.05	(-.29,	.10)
+1SD	.31***	.04	(.23,	.40)	-.30***	.06	(-.41,	-.18)
Conditional indirect effects at values of AC								
-1SD					-.08[s]	.03	(-.15,	-.04)
Mean					-.09[s]	.03	(-.15,	-.05)
+1SD					-.10[s]	.03	(-.16,	-.05)
Index of moderated mediation					-.01[n.s]	.01	(-.03,	.02)

*p < 0.05, **p < 0.01, ***p < 0.001; N = 353;
[c]Elementary/ primary school = 0, Level of education, Secondary school = 1, Tertiary and university = 3
[a] Male = 1, Female = 2;
[b] Urban = 1, Rural = 2
[s] significant effects,
[ns] Not signiticant

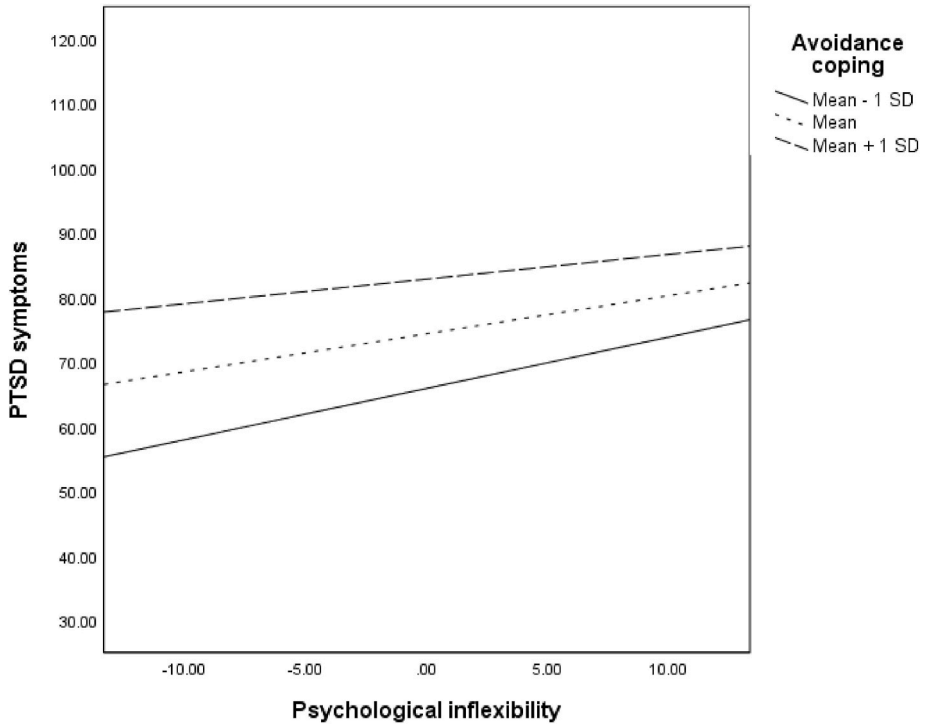

Fig. 2. Interactive effects of psychological inflexibility and avoidant coping strategy on PTSD symptoms scores

constraints, heightened discrimination, xenophobia, and sexual and gender-based violence during the COVID-19 pandemic (Chowdhury et al., 2022; Esses & Hamilton, 2021; Nisanci et al., 2020). All these psychosocial issues can potentially lead to deteriorated mental health and manifestation of PTSD symptoms. Given the limited clinical services in refugee settlements, undertaking interventions to screen and identify cases for further clinical diagnosis and therapy can be helpful.

In the moderated mediation analysis, we found that avoidance and approach coping were positively related to PTSD symptom severity but were not associated with adherence. The positive association between approach coping with PTSD symptom severity requires further investigation. It could be because contexts of high uncertainty, as with the case

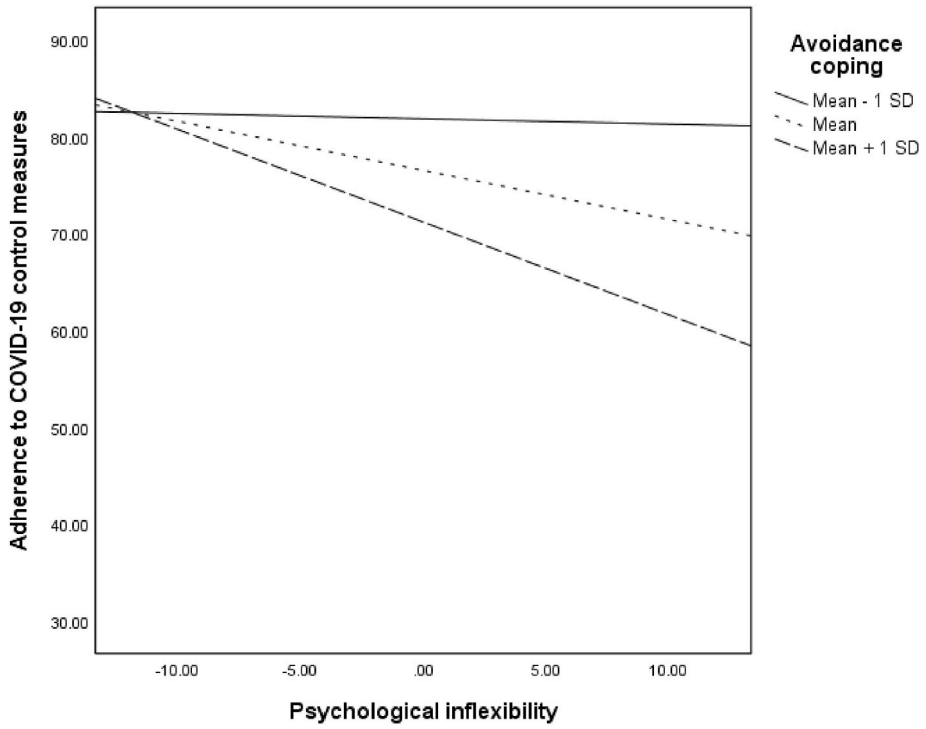

Fig. 3. Interactive effects of psychological inflexibility and avoidant coping strategy on adherence to COVID-19 control measures

of greater PTSD symptoms (Tiet et al., 2006), can predict more approach coping. This suggests the bidirectionality of the association between PTSD symptom severity and approach coping. It is also likely that, in the context of the COVID-19 pandemic which triggered high levels of anxiety across populations, PTSD symptoms could be expected regardless of one's coping strategy. However, from the conservation of resources (COR) theory (Hobfoll, 2001), individuals are likely to experience stress in situations of rapid and impactful loss spirals. Even for refugees that predominantly use approach strategies, coping with the traumas associated with the refugee status and the distress of COVID-19 were likely to result in significant resource loss and vulnerability to experiencing PTSD symptoms.

Overall, whereas avoidance coping moderated both the direct and indirect effects of psychological inflexibility on adherence, approach coping only moderated the effects on PTSD symptom severity. In the context of refugees, intense usage of avoidance by a psychologically inflexible individual could be highly detrimental to mental health and behavior adjustment where required. However, it also seems that people with high levels of inflexibility are already predisposed to using avoidance coping. These findings suggest that decreased levels of psychological inflexibility and avoidance coping would be essential to adherence to further guidelines in controlling the pandemic (e.g., improving vaccination acceptability and uptake). This can also be useful in boosting adherence and behavioral adjustment in similar situations such as the treatment of chronic or dangerous diseases like HIV/AIDS. In clinical terms, a related study indicated that enhancing psychological flexibility, thus reducing psychological inflexibility, is essential for fostering change among refugees in Uganda who are trauma survivors (Lakin et al., 2022). Therefore, therapists could adapt acceptance and commitment therapy (ACT) approaches to reduce inflexibility, foster positive coping, and decrease traumatic stress symptoms among refugees.

In generalizing our findings, several aspects have to be considered. First, our sample was selected from two refugee settlements dominated by refugees from specific countries. For example, South Sudanese refugees were the majority in the Bidibidi settlement, while Somali refugees were the majority of the urban refugees. The generalizability of these findings to refugees from other countries is therefore questionable. Secondly, the data were cross-sectional and collected using self-report instruments. Therefore, common methods bias is possible and causal conclusions cannot be drawn. Third, we used a non-standardized procedure to translate the study questionnaire to Somali, which may affect the validity of the translated questionnaire and the accuracy of responses. Fourth, we assessed PTSD symptom severity with the IES-R, a self-report screening tool for symptoms; therefore, the scores do not represent clinical diagnosis. Although the measure is based on the DSM-IV, it does represent the key diagnostic criteria specified in exhibit 1.3-5 of the ICD-10 (World Health Organisation, 1992). However, there is a need to update the measures and/or develop new ones in line with the proposed criteria for PTSD and/or complex PTSD (CPTSD) in ICD-11 (Karatzias et al., 2017). In addition, we did not collect data on participants' trauma history, which is essential in understanding the development of PTSD symptoms. Lastly, the association of psychological flexibility with PTSD symptom severity and avoidance coping is problematic, given that psychological inflexibility and PTSD both involve an avoidance aspect. However, the conceptual distinctions of the forms of avoidance have been elaborated on in previous research (e.g., Meyer et al., 2019; Schramm et al., 2020). Moreover, the VIF values for our data indicated that multicollinearity was not an issue of concern for the study, suggesting that the measures of psychological inflexibility and avoidance coping are independent of each other.

5. Conclusion

The present COVID-19 pandemic has been a uniquely intense experience for many people worldwide. The anxiety related to the threat of contagion, the forced economic lockdowns, requirements for social distancing, and other behavioral adjustment demands have the power to trigger severe mental health problems. The situation could even be frightening for refugees in a developing county who already live in undesirable conditions, with the majority having experienced traumatic events. The realities of the pandemic have the potential to heighten PTSD symptom severity and consequently thwart adherence to the control measures. Our findings demonstrated that refugees with

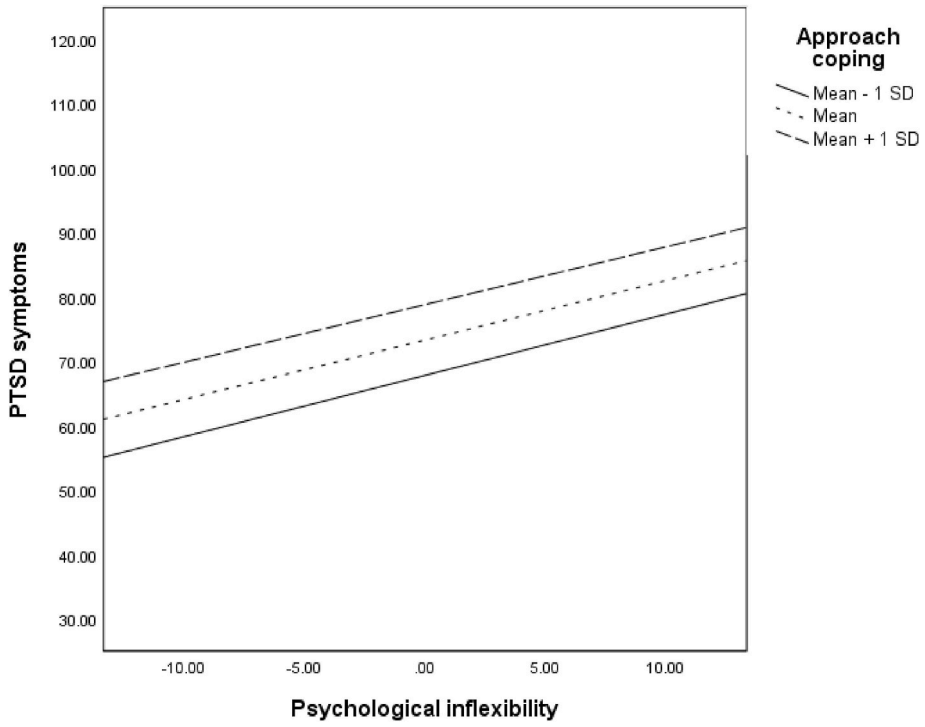

Fig. 4. Interactive effects of psychological inflexibility and approach coping strategy on PTSD symptoms scores

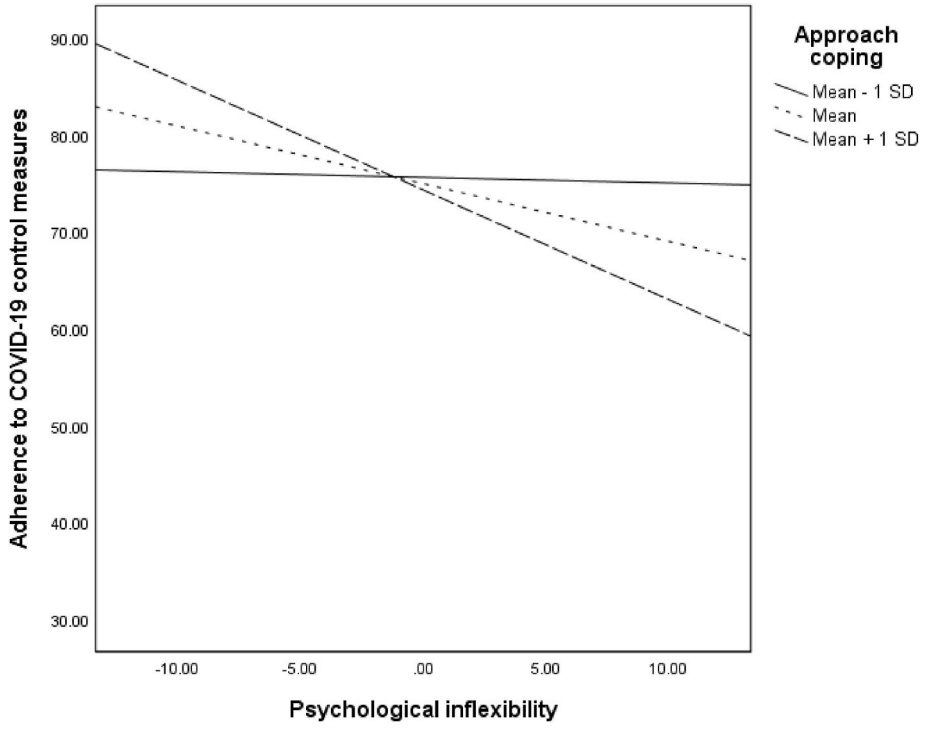

Fig. 5. Interactive effects of psychological inflexibility and approach coping strategy on adherence to COVID-19 control measures

psychological inflexibility were likely to have severe PTSD symptoms and less likely to adhere to COVID-19 preventive measures. This was even more pronounced if an individual relied on avoidance coping. Interventions targeting psychological inflexibility and avoidance coping could be essential in improving adherence to measures as the world moves from containing to vaccination and tackling future crises. Moreover, adoption of therapeutic approaches that reduce psychological inflexibility and boost flexibility could be essential in helping refugees with severe PTSD symptoms and generally fostering psychological health of refugees living in difficult situations.

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Ethics approval statement

This paper has been developed from the larger research project titled "Investigating and Addressing COVID-19 Related Mental Health Challenges in Refugee Settlements and Host Communities in Uganda". The project was given ethical clearance by the Gulu University Research Ethics Committee, Clearance No. GUREC-2020-32.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix 1

Adherence to COVID-19 Prevention Measures:

On a scale of 1 – 6, where 1= 'Never', 6 = 'Very often',
Since the outbreak of COVID-19 pandemic….,

How often do you forget …	
AD1	To wash your hands with soap or use sanitizer
AD2	To wear a face mask
AD3	To maintain a distance of at least two meters from people who are don't belong to your household
In the past two weeks, were there days when you did not…	
AD4	Wash your hands with soap or use sanitizer
AD5	Wear a face mask
AD6	Maintain a distance of at least two meters from people who don't belong to your household
When you travel or leave home, do you sometimes forget to…	
AD7	Carry your hand sanitizer
AD8	Carry your face mask
AD9	Clean yourself up and your clothing when you return home
How often do you have difficulty remembering …	
AD10	To wash or sanitize your hands
AD11	To wear a face mask
AD12	To maintain a distance of at least two meters from people that don't belong to your household
AD13	To isolate yourself when it is necessary
AD14	To clean yourself up and clothing when you return home

On a scale of 1 -6, 1= 'Very inconveniencing', 6= 'Not inconveniencing at all',How often do you feel inconvenienced by the following measures?

AD15	Washing or sanitizing your hands regularly for more than 20seconds each time
AD16	Wearing a face mask
AD17	Maintaining a distance of at least two meters from people who don't belong to your household
AD18	Having to isolate yourself when you think you have been exposed to someone with COVID-19
AD19	Cleaning yourself and clothing immediately you return home

On a scale of 1 – 6, where 1= 'Never', 6 = 'Very often', rate your response.When you feel like COVID-19 is under control or not a real threat, do you sometimes stop?

AD20	Washing your hands with soap or using sanitizer
AD21	Wearing a face mask
AD22	Maintaining a distance of at least two meters from people who don't belong to your household
AD23	Cleaning yourself up and changing your clothing immediately you return home

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