Need for cognitive closure and positive mental health among Italian university students during the COVID-19 pandemic. A multi-level analysis

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ABSTRACT

Studies conducted during the COVID-19 pandemic, a period of pervasive uncertainty, showed that individuals with a high Need For cognitive Closure (NFC) were exposed to higher risk of mental illness. The relationship between NFC and well-being was instead underexplored. This study was thus aimed to investigate the association of NFC with the emotional, social, and psychological components of positive mental health during the first pandemic outbreak. Italian university students ($N = 1799$) completed the Need for Cognitive Closure Scale, the Mental Health Continuum Short Form, and a socio-demographic survey. Adopting a multilevel modelling approach, the predictive role of NFC on participants' mental health was investigated, considering their study curricula. Results showed that the NFC dimensions of need for order and decisiveness were positively associated with all mental health components, while need for predictability, intolerance for ambiguity, and close-mindedness were negatively associated with them. Extending previous evidence of the relationship between NFC and mental illness, these results confirm the usefulness of distinguishing mental health and mental illness and identifying their shared and specific trait predictors.

1. Introduction

The COVID-19 outbreak negatively impacted on all domains of citizens' lives, through the spreading of the infection and the restrictions adopted to prevent contagion, such as lockdowns and curfews (Breslau et al., 2021). High levels of stress, anxiety, and depression were documented across countries (O'Connor et al., 2021) and especially among university students, who reported higher levels of affective symptoms compared to the pre-pandemic period (Frazier et al., 2021). The sudden shift from face-to-face to online education forced them to adopt different learning strategies and a more autonomous management of their academic activities, as well as to cope with greater uncertainty about their professional future (Aristovnik et al., 2020).

In such a pervasively unpredictable situation, individuals showing trait inability to tolerate uncertainty were more exposed to psychological distress (Brizi & Biraglia, 2021; White, 2022).

1.1. Need for Cognitive Closure

The Need for Cognitive Closure (NFC) refers to "an individual's desire for a firm answer to a question and an aversion toward ambiguity"

(Kruglanski & Webster, 1996). It was conceptualized and operationalized as a multidimensional construct including five components: "need for order", referring to the preference for environmental order and structure; "need for predictability", a desire of secure knowledge, affording predictability to future contexts; "decisiveness", an urgent desire to reach closure in personal choices and judgments; "ambiguity intolerance", referring to the affective discomfort perceived in ambiguous situations; and "close-mindedness", the unwillingness to have one's knowledge confronted by alternative opinions or inconsistent evidence (Webster & Kruglanski, 1994). Under uncertain circumstances, individual differences in worldviews related to information processing and judgment may influence coping strategies and consequently psychological wellbeing (Berenbaum et al., 2008; Webster & Kruglanski, 1994). Overall, a positive relationship was detected between NFC levels and affective disorders (Roets & Soetens, 2010).

During the unpredictable situation characterizing the pandemic outbreak, people with high NFC reported stronger discomfort (Brizi & Biraglia, 2021), feelings of being more influenced by the worries of others, and engagement in more preventive behaviors (Pagnini et al., 2020). A positive association was also detected between fear of contagion and the NFC dimension "close-mindedness" (Pagnini et al., 2020).

1.2. The current study

Several studies were conducted among university students during the COVID-19 pandemic; in particular, high NFC levels were positively associated with a higher risk of experiencing anxiety and stress (White, 2022). Limited attention was instead devoted to positive mental health, as a set of indicators of emotional well-being and positive functioning (Keyes, 2002, 2005). Findings from two studies, aimed at simultaneously investigating students' mental health and mental illness levels, showed that most participants reported high levels of positive mental health (Concerto et al., 2022); moreover, both unique and shared predictors of mental illness and mental health were identified (Visser & Law-van Wyk, 2021). Another study involving Italian university students detected high positive mental health levels, as well as levels of academic stress not significantly higher than those reported by student samples in pre-pandemic times (Capone et al., 2020).

To date, there is no evidence concerning the relationship between NFC and positive mental health. To fill this gap, this study was aimed at exploring it among Italian university students, under the highly uncertain circumstances of the first pandemic outbreak.

2. Methods

2.1. Study design and procedures

This cross-sectional study was carried out between April 10 and May 15, 2020, during the first pandemic outbreak. In Italy this period encompassed two phases: Phase 1 (March 8–May 3), characterized by a national lockdown with heavy restrictions in all productive and social activities; Phase 2 (May 4–June 14), in which partial reopening was allowed for some productive sectors. In both phases social distancing, mask use, and hand hygiene regulations were enforced; students' access to university premises and internship venues was suspended; all academic activities were held remotely.

With the support of the Center for Didactic Innovation and Multimedia Technologies (CTU) of the University of Milano, an online survey was uploaded on the University-owned platform. A letter presenting the study and containing the link to the survey was sent via email to the directors of various healthcare, humanities, and social sciences degrees, inviting them to forward it to their students. Interested students could access the survey after signing the informed consent form. Participation was voluntary and participants' anonymity was preserved through pseudonymization.

The study protocol was approved by the Ethical Committee of the University of Milano (N. 20/30, 15 April 2020).

2.2. Participants

Participants were 1799 students, 1395 women (77.5 %) and 404 men (22.5 %), aged 22.9 years on average ($SD = 4.6$). As for marital status, 1668 (92.7 %) were single, 126 (7 %) were married or cohabiting, and 5 (0.3 %) were separated or divorced. Most participants ($N = 1530$, 85 %) reported cohabiting with their family of origin, 122 (6.8 %) with their partner and/or children, 84 (4.7 %) with fellow students/friends; 62 (3.4 %) reported living alone, and one participant did not provide an answer.

Most participants ($N = 1414$; 78.5 %) were full-time students, while 385 (21.4 %) had a job. They were enrolled in different study curricula: 478 (26.6 %) attended Social Sciences and Humanities programs (4 bachelor and 5 master degrees); 1321 (73.4 %) attended Healthcare courses (15 bachelor degrees and 3 master degrees in Healthcare Professions, and single-cycle programs in Medicine and Dentistry).

Around half of the participants (906, 50.4 %) completed the survey during Phase 1 (lockdown), and 893 (49.6 %) during Phase 2 (partial reopening).

2.3. Instruments

The web-based survey included questions on participants' socio-demographic characteristics and the following self-report questionnaires:

- *Mental Health Continuum Short-Form* (*MHC-SF*; Keyes, 2005; Petrillo et al., 2015), assessing the frequency of perceived mental health during the past month through 14 items, on scales ranging from 0 'never' to 5 'everyday'. Three items investigate emotional well-being (EWB; e.g., "How often did you feel happy?"), 5 items social well-being (SWB; e.g., "How often did you feel that you had something important to contribute to society?"), and 6 items psychological well-being (PWB; e.g., "How often did you feel good at managing the responsibilities of your daily life?"). Summed scores for each subscale were calculated. Alpha values were adequate: EWB α = 0.81, SWB α = 0.78, PWB α = 0.85.
- *Need for Closure Scale* (*NFC*; Kruglanski et al., 2013; Pierro et al., 1995), measuring need for cognitive closure through 42 items, on scales from 1 'strongly disagree' to 6 'strongly agree'. Five dimensions are assessed: need for order (10 items), need for predictability (8 items), decisiveness (7 items), ambiguity intolerance (9 items), and close-mindedness (8 items). A summed score was computed for each dimension after transformation of reverse-scored items. Alpha values were deemed as acceptable: NFO α = 0.74, NFP α = 0.80, D α = 0.79, AI α = 0.63, CM α = 0.64.

2.4. Data analysis

After data screening, SPSS 26 was used to compute summary statistics and Pearson's correlations for mental health components, need for closure dimensions and type of university degree. As no direct relation emerged between the data collection phase (lockdown vs. partial reopening) and students' mental health, this variable was not retained for subsequent analysis.

Considering the hierarchical structure of the data – students nested within university degree types – a multilevel modelling approach (Bryk & Raudenbush, 1992) was adopted to investigate the predictive role of NFC on participants' mental health, considering the degree type attended. This approach is most suitable to analyze variables from different levels simultaneously, considering dependence of observations (Hox, 2002); it also yields superior handling of unbalanced data, as was the case in our dataset.

As mental health includes three interrelated components (EWB, SWB, and PWB), a multivariate multilevel regression model was constructed using HMLM2 program in HLM 6.07 software (Bryk & Raudenbush, 1992). The three mental health components were the outcome variable; the five NFC dimensions and the degree type (a dummy variable with 0 = Social Sciences and Humanities, and 1 = Healthcare) were entered as predictors. Mental health was modelled at level 1 (occasions level, $N = 5397$), NFC dimensions at level 2 (participants' level, $N = 1799$), and degree at level 3 (degree level, $N = 31$). Following HLM 6.07 manual (Raudenbush et al., 2004), the mental health components at level 1 were modelled as three indicators, respectively referring to EWB, SWB and PWB. Number of observations at level 1 thus amounted to 5397 (3 indicators times 1799 participants).

The final model was obtained in four analytic steps: first the unconditional intercept-only model was calculated, including no predictors in the equation (Model 0). Subsequently, the independent predictive effects of NFC dimensions (Level 2) on mental health were tested (Model 1). NFC scores were grand mean centered before analyses. In the third step, the independent effect of university degree (Level 3) was added to the equation (Model 2). Finally, in line with Hox (2002), random slopes of NFC dimensions were inspected one by one, to assess whether their relationship with mental health would differ between students attending healthcare degrees and those attending social

sciences and humanities, i.e., if the type of degree would moderate this relationship. If significant random slopes were detected, cross-level interactions between NFC and degree were further tested and, if significant, added to the model (Model 3).

Full Maximum Likelihood (FML) was used as the estimation procedure of the parameters in the models, allowing for calculation of deviance and related Chi square test, necessary to select the best-fitting covariance structure for the models and to compare nested models (see Raudenbush et al., 2004, for details).

In line with the MANOVA approach (Hox, 2002), upon significance of the final multivariate multilevel regression model for mental health, separate two-level models were calculated for EWB, SWB, and PWB, respectively. Participant-level variables (mental health components and NFC dimensions) were entered at level 1, and degree at level 2. The same stepwise procedure was applied for the separate models as for the overall multivariate model. First, the unconditional intercept-only model was calculated (Model 0). Then, NFC dimensions were entered in Model 1, and degree was added in Model 2; in case of significant random slopes, cross-level interactions were tested in Model 3.

3. Results

Descriptive statistics and correlations among study variables are reported in Table 1. As concerns mental health, students' mean values of emotional and psychological well-being were above the scale middle point, while the social well-being score was below it. Positive medium-to-large correlational effects were detected, suggesting that these three components tap into different, though interrelated, aspects of mental health.

As for NFC dimensions, the mean scores of need for order, need for predictability, decisiveness and ambiguity intolerance were above the scale middle point, whereas close-mindedness mean score was below it. The predominance of small-to-medium correlational effects and the presence of negative correlations between the five dimensions attest to the usefulness of analyzing the unique contribution of each dimension to positive mental health.

The NFC dimensions of need for order and decisiveness were positively related to all mental health components, whereas need for predictability, ambiguity intolerance and close-mindedness were negatively related to them. Nevertheless, positive correlations emerged between need for order and need for predictability, ambiguity intolerance and, to a smaller extent, close-mindedness.

Results of the multivariate multilevel regression analyses are displayed in Table 2. Based on the deviances of the intercept-only model, an unrestricted covariance structure was adopted, as it fitted data better than homogenous level-1 variance ($\chi^2(4) = 2591.59$, $p < .001$) or varying level-1 variance ($\chi^2(2) = 163.57$, $p < .001$) structures.

In Model 1, the five NFC dimensions were regressed onto mental health components; the model proved to be superior to the intercept-only model ($\chi^2(5) = 154.76$, $p < .000$). Higher need for order ($t(1793) = 5.62$, $p < .001$) and decisiveness ($t(1793) = 7.63$, $p < .001$) were associated with higher EWB, SWB and PWB, while higher need for predictability ($t(1793) = 3.63$, $p < .01$), ambiguity intolerance ($t(1793) = 5.45$, $p < .001$) and close-mindedness ($t(1793) = 2.02$, $p < .05$) were associated with lower mental health components' levels. Model 2, in which degree type was added at level 3, had a better fit ($\chi^2(1) = 12.66$, $p < .01$) than model 1. Mental health components were still positively predicted by need for order ($t(1793) = 5.48$, $p < .001$) and decisiveness ($t(1793) = 7.51$, $p < .001$), and negatively by need for predictability ($t(1793) = 3.50$, $p < .01$) and ambiguity intolerance ($t(1793) = 5.53$, $p < .03$). In addition, students attending healthcare degrees reported higher mental health than students attending social sciences and the humanities courses ($t(29) = 4.43$, $p < .001$). Random slopes of NFC dimensions were next inspected one by one. As none of them was significant, interactions between NFC and degree were not further tested.

Table 3 illustrates the three separate univariate multilevel models for

Table 1
Means (*M*), standard deviations (*SD*), and correlations among study variables (*N* = 1799).

	M	SD	Scale range	Observed range	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.
1. Gender[a]	–	–	–	0–1	–										
2. Age	22.90	4.60	–	19–63	0.14**	–									
3. Degree type[a]	–	–	–	0–1	0.09**	−0.06+	–								
4. Emotional well-being	9.43	3.10	0–15	0–15	−0.05+	0.03	0.12**	–							
5. Social well-being	9.76	5.30	0–25	0–25	−0.07*	0.06*	0.13**	0.53**	–						
6. Psychological well-being	18.58	6.34	0–30	0–30	−0.01	0.06+	0.16**	0.64**	0.55**	–					
7. Order	39.88	7.34	10–60	14–57	0.02	0.02	0.08*	0.10*	0.09**	0.16**	–				
8. Predictability	30.78	6.95	8–48	8–48	0.05+	0.01	−0.02	−0.11**	−0.09**	−0.09**	0.52**	–			
9. Decisiveness	25.03	6.81	7–42	7–42	−0.08*	0.12**	0.05+	0.27**	0.16**	0.45**	0.16**	−0.08*	–		
10. Ambiguity	39.81	5.72	9–54	12–54	0.10**	−0.03	0.01	−0.15**	−0.14**	−0.08*	0.26**	0.41**	−0.11**	–	
11. Close-mindedness	21.14	5.17	8–48	8–43	0.02	−0.04+	0.05+	−0.12**	−0.11**	−0.21**	0.08*	0.30**	−0.12**	0.14**	–

+ *p* < .05.
* *p* < .01.
** *p* < .001.
[a] Gender: 0 = males; 1 = females. Degree type: 0 = Social Sciences and Humanities; 1 = Healthcare.

Table 2

Multivariate multilevel regression analysis for positive mental health dimensions.

	Model 1 with level-2 variables			Model 2 with level-3 variables		
	B	SE	β	B	SE	β
Fixed part						
Intercept	8.81**	0.11		8.31**	0.14	
Order	0.06**	0.01	0.46	0.06**	0.01	0.45
Predictability	−0.05*	0.01	−0.32	−0.04*	0.01	−0.31
Decisiveness	0.08**	0.01	0.54	0.08**	0.01	0.53
Ambiguity	−0.07**	0.01	−0.41	−0.07**	0.01	−0.41
Close-mindedness	−0.03[+]	0.01	−0.14	−0.03[+]	0.01	−0.16
University program[a]				0.72**	0.16	
Random part						
σ^2_{EWB}	8.82	0.29		8.81	0.29	
σ^2_{SWB}	27.23	0.89		27.06	0.88	
σ^2_{PWB}	130.88	4.37		130.30	4.34	
Model comparison						
Deviance[b]	32,888.54 (13)			32,875.87 (14)		
χ^2	154.75**			12.66[+]		
N occasions (Level 1)	5397			5397		
N participants (Level 2)	1799			1799		
N university courses (Level 3)				31		

[a] Degree type: 0 = Social Sciences and Humanities; 1 = Healthcare.

[b] Degrees of freedom are reported within parentheses. The deviance score for the intercept-only model was 333,043.29 (8).

[+] $p < .05$.

[*] $p < .01$.

[**] $p < .001$.

emotional, social, and psychological well-being. Results substantially replicated those obtained for the multivariate model, highlighting significant predictive independent effects of NFC dimensions and degree type, and no significant random slopes. Models 1 proved superior than the intercept-only models for all mental health components: EWB, $\chi^2(5) = 214.97$, $p < .000$; SWB, $\chi^2(5) = 114.11$, $p < .000$; PWB, $\chi^2(5) = 515.81$, $p < .000$. Similarly, models 2 were superior than models 1: EWB, $\chi^2(1) = 12.21$, $p < .01$; SWB, $\chi^2(1) = 6.66$, $p < .02$; PWB, $\chi^2(1) = 12.39$, $p < .01$.

Focusing on Models 2, students attending healthcare degrees reported higher emotional ($t(29) = 4.29$, $p < .001$), social ($t(29) = 3.02$, $p < .007$) and psychological well-being ($t(29) = 4.51$, $p < .001$) than students attending social sciences and humanities programs.

Higher need for order was associated with higher EWB ($t(1972) = 5.50$, $p < .001$), SWB ($t(1972) = 5.36$, $p < .001$), and PWB ($t(1972) = 6.03$, $p < .001$). Analogously, higher decisiveness was associated with higher EWB ($t(1972) = 3.39$, $p < .001$), SWB ($t(1972) = 4.31$, $p < .001$) and PWB ($t(1972) = 18.87$, $p < .001$). By contrast, higher need for predictability and close-mindedness were associated with lower EWB ($t(1792) = 3.48$, $p < .01$ and $t(1792) = 2.73$, $p < .01$, respectively), SWB ($t(1792) = 2.98$, $p < .01$ and $t(1792) = 3.17$, $p < .01$) and PWB ($t(1792) = 3.12$, $p < .01$ and $t(1792) = 7.29$, $p < .01$). In line with the multivariate model findings, ambiguity intolerance was negatively associated with EWB and SWB ($t(1792) = 4.97$, $p < .001$ and $t(1792) = 4.73$, $p < .001$, respectively), but not significantly associated with PWB.

4. Discussion

The main aim of the present study was to investigate the potential role of NFC in predicting positive mental health of university students during the COVID-19 pandemic, taking into account their study degree

type. Results showed that NFC dimensions and degree type were independently associated with mental health.

The relationship between NFC and mental health was multifaceted; need for order and decisiveness were positively associated with all the mental health components – emotional, social, and psychological well-being - while need for predictability and close-mindedness were negatively associated with them. Intolerance for ambiguity was inversely related to emotional and social well-being, while its association with psychological well-being was not significant.

The positive association of need for order with the three mental health components should be contextualized in the lockdown conditions of the first pandemic outbreak. With the closure of universities, sport premises and socializing venues, students experienced a substantial disruption in their daily routine; due to the interruption of most activities, except for online classes, they also faced a sudden increase in unstructured time. In such a stressful and unpredictable situation, the need for order and structure helped students build a different daily routine, thus serving as a protective factor for their mental health.

The positive association of decisiveness with all mental health components is in line with findings from other studies, showing its negative association with anxiety and depression, obsessive-compulsive disorders, and delusions-proneness in psychosis (Mancini et al., 2002; McKay et al., 2006; White, 2022). Several researchers highlighted that decisiveness, rather than reflecting the need for cognitive closure, refers to the ability to choose and make decisions (Gendi et al., 2023; Roets & Soetens, 2010). Notably, the decisiveness items are aligned in content to the items referring to autonomy, environmental mastery, and purpose in life in the psychological well-being subscale of mental health used in this study. Similarly, a positive association was detected between decisiveness and hopefulness (Öztekin & Bayraktar, 2019), a resource promoting well-being under difficult circumstances (Laslo-Roth et al., 2021). On the other hand, the negative associations of need for predictability, intolerance of ambiguity, and close-mindedness with all the mental health components are consistent with the positive association between NFC and "uncertainty distress" detected during the pandemic (White, 2022; Rettie & Daniels, 2021).

No direct relation emerged between the data collection phase (lockdown vs. partial reopening) and students' mental health. Further, no contribution of the degree type was found in the relationship between NFC and mental health. These results are consistent with the persistence of daily constraints, such as closure of university sites and distance learning, across the two phases.

Independently of NFC levels, healthcare students reported higher mental health compared to students attending Social Sciences and Humanities courses. This finding could be partly attributed to their higher biomedical knowledge, allowing them to better understand the clinical aspects of the pandemic and the protective role of preventive practices (Mourad et al., 2022; Pagnini et al., 2020).

Overall, the results of this study partially contradict evidence of adverse effects of NFC on mental health (White, 2022), rather suggesting that decisiveness and need for order can represent protective factors in times of extraordinary uncertainty, such as the pandemic. In the same vein, in a study involving Chinese participants, preference for order, predictability, and decisiveness were associated with higher COVID-19 related anxiety, which however promoted the adoption of coping strategies related to higher well-being and lower distress (Chen et al., 2021).

Some implications for intervention can be drawn from this study. The pandemic outbreak provided youth with the opportunity to develop adaptive strategies to cope with uncertainty, a condition that may naturally arise in their present and future life. Previous studies highlighted the usefulness of psycho-educational programs to help students focus on their emotional and cognitive reactions to ambiguity and uncertainty (Iannello et al., 2017). Reflective practices, such as mindfulness, could promote students' self-awareness, nonjudgmental attitude, and effective regulation of the "uncertainty discomfort" that can undermine their mental well-being (White, 2022). Intervention programs

Table 3

Univariate multilevel regression analyses for positive mental health dimensions.

	Emotional well-being						Social well-being						Psychological well-being					
	Model 1 with level-1 variables			Model 2 with level-2 variables			Model 1 with level-1 variables			Model 2 with level-2 variables			Model 1 with level-1 variables			Model 2 with level-2 variables		
	B	SE	β	B	SE	β	B	SE	β	B	SE	β	B	SE	β	B	SE	β
Fixed part																		
Intercept	9.43**	0.11		8.90**	0.15		9.73**	0.22		8.88**	0.33		18.47**	0.25		17.25**	0.33	
Order	0.06**	0.01	0.47	0.06**	0.01	0.46	0.11**	0.02	0.80	0.11**	0.02	0.78	0.13**	0.02	0.96	0.13**	0.02	0.94
Predictability	−0.05*	0.01	−0.32	−0.04*	0.01	−0.31	−0.07*	0.02	−0.47	−0.07*	0.02	−0.46	−0.08*	0.02	−0.54	−0.07*	0.02	−0.52
Decisiveness	0.10**	0.01	0.68	0.10**	0.01	0.67	0.08**	0.02	0.54	0.08**	0.02	0.54	0.37**	0.02	2.53	0.37**	0.02	2.51
Ambiguity	−0.06**	0.01	−0.37	−0.07**	0.01	−0.38	−0.11**	0.02	−0.62	−0.11**	0.02	−0.62	−0.02	0.03	−0.11	−0.02	0.03	−0.12
Close-minded.	−0.04+	0.01	−0.18	−0.04*	0.01	−0.20	−0.07*	0.02	−0.38	−0.08*	0.02	−0.40	−0.19**	0.03	−0.96	−0.19**	0.03	−0.99
Univ. program[a]				0.74**	0.17					1.20*	0.40					1.76**	0.39	
Random part																		
σ_r^2	8.40	0.28		8.41	0.28		25.49	0.86		25.54	0.86		29.15	0.98		29.21	0.98	
σ_{U0}^2	0.15*	0.08		0.02	0.03		0.77**	0.36		0.35*	0.35		0.96**	0.43		0.26+	0.26	
Model comparison																		
Deviance[b]	8950.86			8938.65			10,954.91			10,948.25			11,197.77			11,185.38		
	(8)			(9)			(8)			(9)			(8)			(9)		
χ^2	214.97**			12.21*			114.11**			6.66+			515.81**			12.39*		
N participants (Level 1)	1799			1799			1799			1799			1799			1799		
N univ. courses (Level 2)	31			31			31			31			31			31		

σ_r^2 = variance at Level 1; σ_{U0}^2 = variance at Level 2.

[a] Degree type: 0 = Social Sciences and Humanities; 1 = Healthcare.

[b] Degrees of freedom are reported within parentheses. The deviance score for the intercept-only model was 9165.83 (3) for emotional well-being, 11,069.02 (3) for social well-being, and 11,713.58 (3) for psychological well-being.

+ $p < .05$.
* $p < .01$.
** $p < .001$.

may also target students' psychological well-being, through the promotion of cognitive flexibility (Ruini & Fava, 2012).

4.1. Limitations and strengths

This study is not exempt from limitations. The cross-sectional design precludes conclusions about causality. The sample was not representative of the students attending all the degree programs available at the University of Milano. Finally, self-report questionnaires are exposed to the bias of subjectivity and social desirability.

As concerns strengths, the study provides novel evidence of the associations between need for cognitive closure and positive mental health, using an analytical approach that allows for evaluating the role of macro-level variables, in addition to the individual-level ones. Moreover, the large sample of participants provided strong statistical power to the analysis.

5. Conclusions

The results of the study suggest that individual differences in closure needs and abilities (e.g., decisiveness) significantly contributed to the mental health of college students in the uncertain context of the COVID-19 pandemic. Considering the potential role of individual differences in decision-making processes as protective factors for students' mental health, universities could exploit these psychological resources in designing counselling services aimed at helping students to cope with the distress arising under circumstances of uncertainty. Moreover, the present results extend previous findings from clinical studies on the association between cognitive closure and psychopathology, corroborating evidence of mental health and mental illness as two distinct though interrelated constructs, characterized by both unique and shared predictors. Additional studies are needed in this domain, to jointly investigate the associations of NFC with both mental health and mental illness in diverse contexts, samples, and uncertain circumstances.

CRediT authorship contribution statement

A.DF. conceived the study and was responsible for the project administration. M.B designed the study. A.DF and M.B developed the survey tool. M.B analyzed the data. All authors overviewed data analysis and interpretation. S.M wrote the first draft of the paper. All the authors were major contributors in writing (original draft) and contributed to data curation and formal analysis. A.DF. is the guarantor. All authors have read and agreed to the published version of the manuscript.

Data availability

Data will be made available on request.

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