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METACOGNITIVE BELIEFS AND CYBERCHONDRIA AMONG FINAL-YEAR MBBS STUDENTS: THE MEDIATING ROLE OF HEALTH ANXIETY

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Abstract
Cyberchondria, the excessive and distressing online search for health information, is increasingly reported among medical students. The metacognitive model proposes that dysfunctional beliefs about thinking maintain health worry and repetitive coping behaviors. This study aimed to examine the effect of metacognitive beliefs on cyberchondria with health anxiety as a mediator, to compare male and female students on health anxiety, and to compare cyberchondria across self-medication, online health information seeking, response to health problems, and main topic searched online. A cross-sectional quantitative design was employed. Data were collected from 250 final-year MBBS students (M age = 21.85, SD = 1.12) in Rawalpindi and Islamabad, Pakistan, through purposive and convenience sampling. Standardized instruments included the Metacognitions Questionnaire-30 (MCQ-30), Short Health Anxiety Inventory (SHAI), and Cyberchondria Severity Scale-12 (CSS-12). Statistical analyses comprised descriptive statistics, Pearson correlation, linear regression, PROCESS macro mediation, independent-samples t-test, and one-way ANOVA with Tukey post hoc tests. Metacognitive beliefs showed significant positive correlations with cyberchondria and health anxiety, and health anxiety was positively correlated with cyberchondria. Metacognitive beliefs significantly predicted cyberchondria, and health anxiety significantly and partially mediated this relationship. Female students reported significantly higher health anxiety than male students. Cyberchondria differed significantly across self-medication practice, online health information seeking, response to health problems, and main topic searched online. Findings highlight the role of dysfunctional metacognitive beliefs and health anxiety in cyberchondria among medical students. Metacognition-focused screening and interventions, and training in the appropriate use of online health information, are recommended to support the mental health of medical students in Pakistan.

1. INTRODUCTION

The internet has become a primary source of health information for young adults, and its use is particularly common among students of health-related programs. For some individuals, however, searching for health information online does not bring reassurance but increases worry about illness. This pattern is known as

cyberchondria, defined as excessive or repeated online searching for health-related information that is driven by distress and that increases rather than reduces health concerns (Starcevic & Berle, 2013). Cyberchondria has been reported among medical and university students (Sabir & Naqvi, 2023; Santi & Sahoo, 2023), and a study of private medical colleges in Pakistan linked it with health anxiety, health-related fears, and obsessions (Usman et al., 2024). Medical students are exposed to detailed descriptions of diseases and symptoms throughout their training, and final-year students are close to the transition from layperson to health professional, which may make them particularly vulnerable to this cycle.

Health anxiety, defined as fear of or preoccupation with having or developing a serious illness (Salkovskis et al., 2002), is among the strongest correlates and predictors of cyberchondria (Asgher et al., 2022; Ceylan et al., 2024; McElroy & Shevlin, 2014; Starcevic & Berle, 2013; Xu & Starcevic, 2025). A vicious cycle is often described: worry about illness leads to online searching for reassurance, the information found is alarming or ambiguous, and worry increases and prompts further searching. Health anxiety has also been found to mediate the link between other psychological factors and cyberchondria (Ali et al., 2024; Bajcar & Babiak, 2021; Lashkari & Aminoghafi, 2025).

The metacognitive model (Wells, 2009) and the Self-Regulatory Executive Function (S-REF) model (Wells & Matthews, 1994) offer an account of why such cycles persist. In this model, psychological distress is maintained by a cognitive attentional syndrome of worry, rumination, threat monitoring, and unhelpful coping, which is driven by metacognitive beliefs, that is, beliefs about thinking itself, such as the belief that worry is useful or that thoughts are uncontrollable and dangerous. Dysfunctional metacognitive beliefs have been associated with anxiety and distress in physical illness (Capobianco et al., 2020) and with health anxiety (Bailey & Wells, 2015; Keen et al., 2022). Applied to cyberchondria, repeated online searching can be understood as a coping strategy used to reduce uncertainty and obtain reassurance that instead keeps attention focused on illness. In line with this, Nadeem et al. (2022) found that metacognitive beliefs predicted cyberchondria and moderated the relationship between health anxiety and cyberchondria, and Batool et al. (2022) reported significant relationships among metacognitive beliefs, health anxiety, and cyberchondria in adults.

Although these studies suggest that metacognitive beliefs, health anxiety, and cyberchondria are linked, the pathway from metacognitive beliefs through health anxiety to cyberchondria has received little attention among medical students in Pakistan, where health-related internet use is increasing. Individual differences may also shape vulnerability. Anxiety-related problems are generally reported more often in women than in men (McLean et al., 2011), although findings on gender differences in health anxiety and related constructs are not consistent across populations (Fang & Mushtaque, 2024; Kefeli Col et al., 2025). In addition, health-related behaviors such as self-medication, the frequency of online health searching, the main reason for searching, and the usual response to a health problem may identify students at higher risk. Cyberchondria has been found to be higher among university students who diagnose themselves through the internet (Sabir & Naqvi, 2023), but these behaviors have not been compared systematically among final-year MBBS students.

The present study therefore aimed to examine the effect of metacognitive beliefs on cyberchondria with health anxiety as a mediator, to compare male and female students on health anxiety, and to compare cyberchondria across self-medication practice, frequency of online health information seeking, response to health problems, and main topic searched online. It was hypothesized that (1) metacognitive beliefs would significantly and positively predict cyberchondria, (2) metacognitive beliefs would significantly and positively predict health anxiety, (3) health anxiety would significantly and positively predict cyberchondria, (4) health anxiety would significantly mediate the relationship between metacognitive beliefs and cyberchondria, (5) female students would report significantly higher health anxiety than male students, and (6) cyberchondria would differ significantly across self-medication practice,

online health information seeking, response to health problems, and main topic searched online.

2. Method

2.1 Study Design and Participants

Data collection was done using a quantitative cross-sectional research design. A total of 250 final-year MBBS students (100 males and 150 females, M = 21.85, SD = 1.12) from the universities of Rawalpindi and Islamabad, Pakistan, were included in the study. Purposeful and convenience sampling of students who understood Urdu/English and have given informed consent and were in their final year of MBBS were done. Students who were not in their final year, had a severe psychiatric disorder or were under psychiatric treatment, or did not consent were excluded. The sample size was determined using G*Power to relate multiple regression and simple regression with one-way ANOVA (three groups) to detect an effect of f^2 = .03 and f = .20, respectively, at the α = .05 level, and the sensitivity analysis indicated the study had 80% power to detect an effect of f^2 = .03 with N = 250 and α = .05, and 80% power to detect an effect of f = .20 with N = 250 and α = .05.

2.2 Procedure

Following institutional ethical approval American Psychological Association (APA) for psychological research. Formal approval in the ethics of data collection will be achieved from the Institutional Review Board (IRB) of the National University of Medical Sciences. Participants were briefed about the study's purpose, and written informed consent was obtained from all individuals. Anonymity and confidentiality were assured, and participation was voluntary. Data were collected through paper questionnaire packets and online forms and completing the demographic sheet and the three scales took about 15 minutes. Data were analyzed using IBM SPSS Statistics version 26 and the PROCESS macro (Hayes, 2022).

2.3 Measures

A demographic sheet was recorded that included age, gender, social class, self-medication without a doctor, what steps they took if they had health issues, how often they looked for health information online, the primary topic searched online, and other health characteristics and internet use. The Metacognitions Questionnaire-30 (MCQ-30; Wells & Cartwright-Hatton, 2004) is a self-report, 30-item questionnaire that measures five metacognitive beliefs: positive beliefs about worry, negative beliefs about uncontrollability and danger, cognitive confidence, need to control thoughts, and cognitive self-consciousness. Responses range from 1 (Do not agree) to 4 (Agree very much) with total scores ranging from 30 to 120 and Cronbach's α reported between .72 and .93. Cyberchondria was measured with the Cyberchondria Severity Scale-12 (SS-12; McElroy et al., 2019), which is a 12-item scale that rates symptomology on a scale from 1 (never) to 5 (always), and has been reported to have a Cronbach's alpha ranging from .73 to .95; total scores range from 12 to 60. The Short Health Anxiety Inventory (SHAI; Salkovskis et al., 2002) is an 18-item instrument with each item having four statements scored on a 0 (least) to 3 (most) scale for the past six months, ranging from 0 to 54 (first 14 items health worry, last four items negative consequences of being seriously ill) with Cronbach's alpha ranging from .86 to .96 reported. The higher the score on each of the three scales, the higher is the level of the construct. The scales were translated into Urdu according to Beaton et al. (2000); there were two bilingual translators who translated the scales independently, then both were synthesized, and two translators who were not aware of the original scales back translated them and an expert committee reviewed all versions. The pre-final versions were pre-tested with 50 final year MBBS students and the internal consistency was acceptable (MCQ-30 α = .82, CSS-12 α =.75, SHAI α = .74). The Cronbach α for the MCQ-30, CSS-12 and SHAI were .86, .78 and .75 respectively in the present sample.

3. Results

Table 1 Frequency and Percentage of Demographic Variables (N = 250)

Variables	F	%
Gender		
Male	100	40.0
Female	150	60.0
Are you currently enrolled in Final Year MBBS?		
Yes	250	100.0
No	0	0
Social Class		
Upper	126	50.4
Middle	124	49.6
Lower	0	0
Do you think you have problems with your health?		
Yes	169	67.6
No	81	32.4
Do you have any diagnosed chronic medical condition?		
Yes	0	0
No	250	100.0
Do you practice self-medication without consulting a physician?		
Never	74	29.6
Sometimes	93	37.2
Often	83	33.2
Have you experienced significant health anxiety in the past 6 months?		
Yes	153	61.2
No	97	38.8
Measures taken in case of health problems		
Wait for recovery	49	19.6
Apply my own medical knowledge	54	21.6
Look for source of problem on the internet	110	44.0
Visit a doctor	37	14.8
Consult a friend	0	0
Primary device used for internet access		
Mobile Phone	220	88.0
Laptop/Computer	30	12.0
Tablet	0	0
Mobile usage per day		
1–2 hours	0	0
2–4 hours	148	59.2
5–6 hours	102	40.8
8–10 hours	0	0
How often do you search for health-related information online?		
Less than once per month	48	19.2
Once per month	94	37.6
Once per week	108	43.2

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Several times per week	0	0
Do you believe the internet is as good as a physician for health information?		
Yes	114	45.6
No	136	54.4
Main topic searched online		
Symptoms	61	24.4
Disease diagnosis	158	63.2
Treatment options	31	12.4
Medication side effects	0	0
Do you search health-related information online without consulting a physician?		
Yes	172	68.8
No	78	31.2
Do you believe internet health information is as reliable as a physician's advice?		
Yes	109	43.6
No	141	56.4
Not sure	0	0
Have you or a close family member experienced a serious medical illness in the past 2 years?		
Yes	149	59.6
No	101	40.4

Note. f = frequency; % = percentage.

Table 1 presents sociodemographic characteristics of the sample. Table 2 summarizes the psychometric properties of the study measures. Internal consistencies were α = .86 (MCQ-30), α = .78 (CSS-12), and α = .75 (SHAI), reflecting acceptable to good reliability. Mean scores were above the scale midpoints for metacognitive beliefs (M = 78.73, SD = 8.18), cyberchondria (M = 43.13, SD = 4.13), and health anxiety (M = 36.07, SD = 3.20). Skewness and kurtosis values for all variables fell within ±2, indicating approximate normality of the data.

Table 2 Descriptive Statistics and Psychometric Properties of the Study Measures (N = 250)

Scale	k	α	M	SD	Actual range	Potential range	Skewness	Kurtosis
MCQ-30	30	.86	78.73	8.18	58–90	30–120	−0.80	0.26
CSS-12	12	.78	43.13	4.13	32–52	12–60	−1.01	1.98
SHAI	18	.75	36.07	3.20	30–40	0–54	−0.50	−0.96

Note. k = number of items; α = Cronbach's alpha; MCQ-30 = Metacognitions Questionnaire-30; CSS-12 = Cyberchondria Severity Scale-12; SHAI = Short Health Anxiety Inventory.

Table 3 Pearson Correlations among Study Variables (N = 250)

Variable	M	SD	1	2	3
1. MCQ-30	78.73	8.18	–		
2. CSS-12	43.13	4.13	.245**	–	
3. SHAI	36.07	3.20	.206**	.345**	–

Note. **p < .01.

Table 3 presents the Pearson correlations among the study variables. Metacognitive beliefs were positively and significantly correlated with cyberchondria (r = .245, p < .01) and health anxiety (r = .206, p < .01), and health anxiety was positively and significantly correlated with cyberchondria (r = .345, p < .01).

Table 4 Simple Linear Regression of Metacognitive Beliefs on Cyberchondria (N = 250)

Predictor	B	SE	β	t	p
Constant	33.39	2.45	–	13.63	< .001
Metacognitive beliefs	0.124	0.031	.245	3.98	< .001

Note. Dependent variable = cyberchondria (CSS-12). B = unstandardized coefficient; SE = standard error; β = standardized coefficient. R^2 = .06, ΔR^2 = .06, F(1, 248) = 15.84, p < .001.

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Table 4 presents the results of a simple linear regression examining metacognitive beliefs as a predictor of cyberchondria. Metacognitive beliefs significantly and positively predicted cyberchondria (B = 0.124, SE = 0.031, β = .245, t(248) = 3.98, p < .001), indicating that higher levels of metacognitive beliefs were associated with higher levels of cyberchondria. The overall model was statistically significant, F(1, 248) = 15.84, p < .001, and explained 6% of the variance in cyberchondria (R^2 = .06), reflecting a small but significant contribution of metacognitive beliefs.

Table 5 Mediating Effect of Health Anxiety on the Relationship of Metacognitive Beliefs and Cyberchondria (N = 250)

Path	B	SE	t	P	LL	UL
MCQ-30 → SHAI (a)	0.081	0.024	3.32	.001	0.033	0.128
SHAI → CSS-12 (b)	0.397	0.077	5.13	< .001	0.245	0.549
MCQ-30 → CSS-12 (direct, c′)	0.092	0.030	3.03	.003	0.032	0.151
Indirect effect (a × b)	0.032	0.012	–	–	0.012	0.057
Total effect (c)	0.124	0.031	3.98	< .001	0.062	0.185

Note. LL and UL = limits of the bootstrapped 95% CI (5,000 resamples).

Table 5 presents the mediation results (PROCESS Model 4). Metacognitive beliefs significantly predicted health anxiety (B = 0.081, SE = 0.024, t = 3.32, p = .001), and health anxiety significantly predicted cyberchondria (B = 0.397, SE = 0.077, t = 5.13, p < .001). The direct effect of metacognitive beliefs on cyberchondria remained significant (B = 0.092, SE = 0.030, t = 3.03, p = .003). The indirect effect through health anxiety was statistically significant (B = 0.032, BootSE = 0.012, 95% BootCI [0.012, 0.057]), confirming partial mediation, and accounted for about 26% of the total effect (B = 0.124). Thus, metacognitive beliefs influenced cyberchondria both directly and indirectly through health anxiety.

Table 6 Gender Differences in Health Anxiety (N = 250)

Variable	Male (n = 100) M (SD)	Female (n = 150) M (SD)	t	df	p	Cohen's d
SHAI	34.50 (3.10)	37.20 (2.95)	−6.84	248	< .001	0.89

Note. SHAI = Short Health Anxiety Inventory.

Table 6 presents the difference in health anxiety between male and female students. Female students reported higher health anxiety (M = 37.20, SD = 2.95) than male students (M = 34.50, SD = 3.10). An independent-samples t-test indicated that this difference was statistically significant, $t(248) = -6.84$, $p < .001$, with a large effect size (Cohen's d = 0.89).

One-way ANOVA was used to compare cyberchondria across four grouping variables (Table 7). Cyberchondria differed significantly across self-medication practice, $F(2, 247) = 12.04$, $p < .001$, $\eta^2 = .089$; online health information seeking, $F(2, 247) = 6.07$, $p = .003$, $\eta^2 = .047$; response to health problems, $F(3, 246) = 6.49$, $p < .001$, $\eta^2 = .073$; and main topic searched online, $F(2, 247) = 5.54$, $p = .004$, $\eta^2 = .043$. Levene's test was non-significant for all four variables. All four ANOVAs remained significant at a Bonferroni-adjusted level of .0125.

Table 7 One-Way ANOVA for Cyberchondria across Demographic and Health-Related Behavior Groups (N = 250)

Variable	Group	n	M	SD	F	Df	p	η^2
Self-medication	Never	74	41.54	3.76	12.04	2, 247	< .001	.089
	Sometimes	93	43.04	3.96				
	Often	83	44.64	4.12				
Online health information seeking	Less than once per month	48	41.60	3.92	6.07	2, 247	.003	.047
	Once per month	94	42.90	4.12				
	Once per week	108	44.00	4.04				
Response to health problems	Wait for recovery	49	41.88	3.87	6.49	3, 246	< .001	.073
	Own medical knowledge	54	42.98	4.07				
	Search on internet	110	44.28	3.95				
	Visit a doctor	37	41.58	4.23				
Main topic searched online	Symptoms	61	42.08	3.95	5.54	2, 247	.004	.043
	Disease diagnosis	158	43.78	4.08				
	Treatment options	31	41.88	4.16				

Note. Cyberchondria = CSS-12 total score; η^2 = eta squared.

Table 8 presents the Tukey HSD post hoc comparisons. All three self-medication groups differed significantly, with cyberchondria increasing from never to sometimes to often. For online health information seeking, only students who searched less than once per month and those who searched weekly differed significantly. Students who searched the internet in response to health problems scored higher than those who waited for recovery and those who visited a doctor, and students who searched for disease diagnosis scored higher than those who searched for symptoms or treatment options. The remaining comparisons were non-significant.

Table 8 Tukey HSD Post Hoc Comparisons of Cyberchondria across Groups

Variable	Comparison (I–J)	Mean Difference	SE	95% CI [LL, UL]
Self-medication	Never – Sometimes	−1.50*	0.62	[−2.95, −0.05]
	Never – Often	−3.10*	0.63	[−4.59, −1.61]
	Sometimes – Often	−1.60*	0.60	[−3.01, −0.19]
Online health information seeking	Less than monthly – Monthly	−1.30	0.72	[−2.99, 0.39]
	Less than monthly – Weekly	−2.40*	0.70	[−4.06, −0.74]
	Monthly – Weekly	−1.10	0.57	[−2.45, 0.25]
Response to health problems	Wait – Own knowledge	−1.10	0.79	[−3.14, 0.94]
	Wait – Internet	−2.40*	0.69	[−4.18, −0.62]
	Wait – Doctor	0.30	0.87	[−1.96, 2.56]
	Own knowledge – Internet	−1.30	0.67	[−3.02, 0.42]
	Own knowledge – Doctor	1.40	0.85	[−0.81, 3.61]
	Internet – Doctor	2.70*	0.76	[0.73, 4.67]
Main topic searched online	Symptoms – Diagnosis	−1.70*	0.61	[−3.14, −0.26]
	Symptoms – Treatment	0.20	0.90	[−1.91, 2.31]
	Diagnosis – Treatment	1.90*	0.80	[0.02, 3.78]

Note. SE = standard error; CI = confidence interval. *p < .05.

4. Discussion

The present study compared the relationships between metacognitive beliefs, health anxiety and cyberchondria among MBBS final year students and whether there was a difference in cyberchondria across health-related behaviors. All of the six hypotheses were confirmed and the results matched those of the metacognitive model (Wells, 2009) for a medically literate sample.

This finding was consistent with the previous studies conducted by Nadeem et al. (2022), and Batool et al. (2022), where metacognitive beliefs were found to be significant predictors of cyberchondria. If we look from a metacognitive standpoint, beliefs about thinking maintain worry and threat monitoring, and repeated online searches can be employed to alleviate an unsettling thought or to provide reassurance, but serve to reinforce worry and illness. The effect was small (R^2 = .06), meaning that metacognitive beliefs is one among multiple factors that contribute to OCD (Fergus, 2015; Usman et al., 2024) The results do not indicate which dimension of metacognitive beliefs is the most crucial, as the total score of the MCQ-30 was used.

The metacognitive beliefs also predicted health anxiety, which parallels with a systematic evidence base that links metacognitive beliefs with health anxiety (Keen et al., 2022) and with Bailey and Wells (2015). The same relationship was observed among students who had some medical training, indicating that it is not medical training that eliminates the effect of dysfunctional beliefs on health worry. Health anxiety in turn predicted cyberchondria, and remained a significant predictor when controlling metacognitive beliefs, consistent with research that found health anxiety to be a major correlate of cyberchondria (Asgher et al., 2022; Ceylan et al., 2024; McElroy & Shevlin, 2014; Starcevic & Berle, 2013; Xu & Starcevic, 2025).

Metacognitive beliefs was partially correlated with cyberchondria through the mediation of health anxiety. The overall effect was approximately 25% indirect with significant direct effect. This is consistent with research that found health anxiety was the mediator Other psychological factors and cyberchondria (Ali et

al., 2024; Bajcar & Babiak, 2021; Lashkari & Aminoghafi, 2025). Based on the metacognitive model, negative beliefs about thinking are factors that cause health anxiety, and coupled with the desire to alleviate uncertainty, result in repeated searches. The strong direct effect indicates that metacognitive beliefs might also impact searching through other pathways, such as making it more difficult to focus away from health-related thoughts. The mediation is in the form of a statistical pattern and not a causal sequence, because the data are cross-sectional.

The female students showed higher health anxiety than the male students, which is consistent with the overall trend of a higher prevalence of anxiety related problems in women (McLean et al., 2011). Women might be more likely to report or discuss sensations or discomfort in the body while men may be less likely to complain about health concerns due to gender norms. Gender difference in health anxiety and related constructs has been found to differ across populations (Fang & Mushtaque, 2024; Kefeli Col et al., 2025) and the difference observed in the present study was large and the groups were not balanced in size, therefore, the difference needs to be validated in more balanced samples.

The prevalence of cyberchondria varied widely between self-medication practice, frequency of online health information seeking, attitudes towards health problems, and primary topic searched online. Students who reported being on medication frequently, seeking information weekly, relying on the internet to manage health concerns or diagnoses for health-related problems reported higher cyberchondria. These findings support the health-related worry maintained through repeated online searches and self-diagnosis (Starcevic & Berle, 2013; Starcevic et al., 2020) and those reported by Sabir and Naqvi (2023) in their study, which reported that students who self-diagnosed using the internet had higher levels of cyberchondria. From a metacognitive perspective, search and self-treatment behaviors can serve as safety behaviors to alleviate uncertainty, thereby serving to sustain worry and threat monitoring (Wells, 2009). Students who went to a doctor had the lowest scores, indicating that professional reassurance might not stimulate the search cycle as much. The effect sizes were small to medium (η^2 = .043 to .089), and the behavior variables were self-reported.

Conclusion

The present study aimed at exploring the relationship between metacognitive beliefs, health anxiety and cyberchondria in the final year MBBS students. Results showed the metacognitive beliefs were significant predictors of cyberchondria, health anxiety was partly mediated in this relationship, females had higher health anxiety, and cyberchondria was higher among students who often self-medicated, searched the internet weekly, relied on the internet when faced with health problems, and searched for disease diagnosis. The results highlight the importance of screening health anxiety and cyberchondria among medical students, and the need of detached mindfulness and attention training, as well as educating students on the proper use of health information online and the dangers of self-medication and self-diagnosis in Pakistani medical education.

Limitations

There are a few caveats to take into account with these results. First, the cross-sectional design does not allow for causal inference. Second, self-report measures only are prone to social desirability bias. Third, purposive and convenience sampling was used for sampling, which is not generalizable and the number of males and females were not equal. Fourth, the ranges observed were narrower than the ranges possible, especially for the SHAI, which could have limited variability. Fifth, the scales were self-medication, internet searching, and response to health issues, each with only one item and some of the response categories lacked responses, and the Urdu versions were only tested in a small pilot sample. Finally, data were gathered on paper and online and four ANOVAs were performed, with all still being significant even after the Bonferroni adjustment.

Suggestions

Longitudinal or experimental designs should be used in future studies to help elucidate causal

mechanisms among the variables studied. Increased sample size and gender balance from multiple institutions and years of study would increase representativeness. Additional measures of self-medication and online health searching, validated multi-item measures of self-medication and online health searching and/or research into intolerance of uncertainty, health literacy, and specific metacognitive dimensions as further mediators or moderators should be explored, and the effectiveness of metacognitive interventions in reducing cyberchondria among medical students should be evaluated.

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