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The Paradox of Intellectual Humility: A Hidden Pathway to Misplaced Certainty

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Article

Keywords: intellectual humility, need for cognitive closure, misplaced certainty, source selection

Posted Date: June 2nd, 2026

DOI: https://doi.org/10.21203/rs.3.rs-9492783/v1

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Additional Declarations: No competing interests reported.

Abstract

Intellectual humility (IH) is widely regarded as a cognitive vaccine against misplaced certainty in the information age. Yet a puzzling question remains unresolved: do individuals who clearly acknowledge their own epistemic limits truly remain open to diverse information, or do they merely pursue certainty in a subtler form? Drawing on a sample of 519 Chinese adults, this study employs a four-stage progressive design to examine how intellectual humility shapes information-source decisions. Results reveal that IH is significantly and negatively associated with the breadth of source exposure (β = − 0.126): rather than casting a wide net, high-IH individuals adopt a quality-first strategy, showing a pronounced preference for formal sources (β = 0.189) and a clear avoidance of informal ones (β = − 0.160). More counterintuitively, IH is positively associated with the Need for Cognitive Closure (NFCC; β = 0.139): awareness of one's own ignorance does not breed tolerance for ambiguity but, on the contrary, intensifies the pursuit of certainty. A person-centered cluster analysis further identifies four user typologies, among which the "Certain Dependents," characterized by low IH, high government trust, diminished sense of control, embody the prototypical psychological profile of misplaced certainty. By reconceptualizing intellectual humility from a virtue-theoretic commitment to openness into a meta-cognitive decision mechanism that drives quality-based filtering, this study identifies a second, overlooked pathway to false confidence: the pursuit of certainty springs not only from the blindness of the overconfident, but also from the anxiety of the humble.

1. Introduction

In an era of political turbulence, information overload, and eroding social consensus, false confidence and misplaced certainty have emerged as central concerns in interdisciplinary research (Meyer, 2019). From uncritical belief in misinformation during the COVID-19 pandemic, to the proliferation of political conspiracy theories, to the polarization surrounding climate change and vaccination, and now to the torrent of truth and falsehood rendered indistinguishable in the age of generative AI, one shared psychological mechanism keeps resurfacing: even when evidence is manifestly insufficient, people remain capable of generating—and clinging to—a subjectively solid sense of certainty. Such certainty is not a rational judgment grounded in sufficient evidence, but a psychological refuge for those with nowhere left to retreat in the face of uncertainty. It offers a sense of safety while at the same time eroding public trust, dismantling rational dialogue, and fueling group polarization. In response to this symptom of our times, scholars have increasingly turned their attention to Intellectual Humility (IH)—a meta-cognitive trait characterized by acknowledgment of one's epistemic limits and a reasoned reserve toward one's own views—treating it as a cognitive vaccine against the epistemic challenges of the information age (Bowes et al., 2022; Gorichanaz, 2022; Leary et al., 2017).

A question that has rarely been confronted head-on, however, is this: Does intellectual humility itself truly free individuals from the pursuit of certainty in real-world information decisions? Or do even those most keenly aware of their own ignorance fall prey to the same psychological mechanism in a subtler guise—pursuing not the emotionally charged, opinion-based certainty of firm partisans, but an institutionalized,

authority-backed certainty of reliability? The two dominant strands of the existing literature—the virtue-epistemology perspective (Marcum, 2009; Roberts & Wood, 2007) and the metacognitive perspective (Clemente, 2024; Song et al., 2023)—share a common, untested premise: because the intellectually humble acknowledge their own ignorance, they ought to tolerate uncertainty and remain open to diverse information. Scattered empirical clues, however, suggest that this premise may not hold (Gollwitzer et al., 2022). The present study labels this under-examined possibility the humility paradox and offers the first systematic empirical test of it.

In confronting the contemporary malady of false confidence and misplaced certainty, psychology and epistemology have proposed a range of possible antidotes—critical thinking, openness to experience, need for cognition, and analytic thinking disposition, among others (Pennycook & Rand, 2021). Each of these constructs has its merits, yet all share a common limitation: they primarily address how individuals think about information, and rarely engage the higher-order capacity to examine one's own thinking. What gives intellectual humility its irreplaceable position among these candidate constructs is that it operates directly at the meta-cognitive level—the cognition of self-cognition. This distinctiveness renders IH theoretically isomorphic to the problem of misplaced certainty: if the essence of false confidence lies in generating subjective certainty despite insufficient evidence, then its most direct countervailing force should not be sharper thinking skills, but the meta-cognitive capacity to interrogate why one feels certain in the first place. Testing whether this theoretical promise is actually borne out in a contemporary information ecosystem—one in which algorithmic recommendations, AI-generated content, and heterogeneous sources coexist—has therefore become a foundational psychological question for understanding information polarization and the collapse of public trust.

Drawing on 519 valid survey responses and employing a four-stage progressive design, this study systematically pursues interrelated questions. First, does intellectual humility promote breadth-based openness in source exposure, or does it instead drive a quality-first narrowing? Second, as the core motivational construct underlying the pursuit of certainty, what mediating role does the Need for Cognitive Closure (NFCC) play between IH and source selection? Third, when psychological traits act in combination rather than in isolation, can a person-centered typological analysis identify prototypical user profiles that fit the psychological structure of false confidence? Accordingly, the study examines in sequence the effect of IH on source breadth, its differentiated preferences for formal versus informal sources, and the mediating and moderating role of NFCC, before constructing a user typology through K-means clustering.

By addressing these questions systematically, the present study seeks to advance contemporary debates on false confidence and cognitive resilience in two principal ways. First, it reconceptualizes intellectual humility—from a virtue-epistemological commitment to breadth-based openness into a meta-cognitive decision mechanism that drives quality-based filtering—thereby uncovering a pathway to false confidence that the existing literature has overlooked: the pursuit of certainty stems not only from the blindness of the overconfident, but also from the anxiety of the humble. The more keenly one perceives the limits of one's own knowledge, the more intensely one craves reliable answers—precisely to dispel

the epistemic anxiety born of self-aware ignorance.Second, through a person-centered typological analysis, the study identifies a distinct psychological profile—the "Certain Dependents"—characterized by the combination of low IH, high government trust, and low sense of control, thereby offering an empirical anchor for future research into the social-psychological structure of misplaced certainty. Taken together, these findings point to a practical implication: in an age of information overload, effective strategies for media-literacy education, algorithmic-recommendation design, and the rebuilding of public trust lie in helping the public recognize the psychological sources of their own felt certainty.

2. Conceptual Foundations and Hypotheses

2.1 Intellectual Humility: From Virtue Epistemology to a Meta-cognitive Decision Mechanism

Intellectual Humility (IH) is rooted in the tradition of virtue epistemology, which shifts the epistemic focus from knowledge itself to the intellectual virtues that generate it (Roberts & Wood, 2007). IH encompasses both a cognitive-ability dimension and a character dimension, manifesting as realistic self-assessment of one's epistemic limits, attitude management regarding the relationship between one's own views and those of others, and low self-concern about one's own beliefs (McElroy et al., 2014). Unlike humility in general, intellectual humility refers specifically to humility in the epistemic domain, emphasizing an open attitude to contested issues.

With the development of the Comprehensive Intellectual Humility Scale (CIHS) by Krumrei-Mancuso and Rouse (2016), the construct was operationalized within psychology and gave rise to a systematic research program. Two mutually resonant strands of scholarship have since taken shape around IH. The virtue-epistemology strand treats IH as a stable character disposition that enables sound epistemic activity (Marcum, 2009); empirical work in this vein reports that high-IH individuals are more willing to actively seek out diverse information (Leary et al., 2017), more receptive to dissenting content (Deffler et al., 2016), less susceptible to conspiracy theories and fake news (Bowes et al., 2022; Meyer, 2019), and more inclined to rely on scientific consensus rather than emotional intuition. The metacognitive strand, by contrast, conceives of IH as a reflective capacity to monitor and regulate one's own cognitive processes (Clemente, 2024; Song et al., 2023): IH is not merely a static awareness of one's ignorance, but a dynamic scrutiny of the limits of one's knowledge. Together, these two strands have cast IH as the theoretical image of a "cognitive vaccine for the information age."

Yet both strands share an untested premise: because the intellectually humble acknowledge their own ignorance, they ought to tolerate uncertainty and remain open to diverse information. What, however, if this premise does not hold? What if self-aware ignorance, rather than fostering ease with ambiguity, instead intensifies the pursuit of reliable answers? Scattered evidence has already hinted at this possibility: even as high-IH individuals actively seek information, their keen awareness of its uneven quality may lead them to filter it more cautiously (Gollwitzer et al., 2022). The latent tension between IH's theoretical promise and its behavioral pattern forms the point of departure for this study. As an

intellectual virtue, IH should in principle promote exposure to a wider range of sources; yet insofar as it is also a meta-cognitive capacity highly sensitive to information quality, it may equally drive individuals to concentrate on high-quality sources and narrow the breadth of their exposure. This yields a pair of directional hypotheses:

H1a: Intellectual humility is significantly and positively associated with the breadth of information-source exposure.

H1b: Intellectual humility is significantly and negatively associated with the breadth of information-source exposure.

2.2 Source Decisions: Quality-First Filtering within a Formal–Informal Binary

Source selection constitutes the earliest and most decisive cognitive step in the chain of information processing; where one obtains information largely determines what one can subsequently process and believe (Cao & Deng, 2006). Among the many factors at play, metacognitive capacity is regarded as pivotal (Heinström, 2003; Nelson & Narens, 1990), helping individuals appraise source reliability and adjust their information-seeking strategies accordingly. In the Chinese media context, sources exhibit a clear binary structure. Formal sources refer to content produced by authoritative institutions such as Party newspapers and state news agencies under stringent editorial review, and they carry high credibility and normative standing; informal sources, by contrast, refer to content published through personal accounts and non-professional platforms with uneven editorial standards (Wang & Jin, 2019; Du et al., 2022). This binary is more than a taxonomy of sources; it is a socialized vehicle of subjective certainty. Formal sources, through institutionalized review and authoritative endorsement, furnish a "certainty one can trust," whereas informal sources, through immediacy and emotional resonance, furnish a "certainty one can feel."

As a meta-cognitive virtue highly sensitive to information quality, IH should produce distinct preferences when confronted with this binary. Formal sources, with institutionalized review mechanisms that guarantee higher-quality information, are more readily adopted by high-IH individuals, whereas informal sources, being a mixture of truth and falsehood, are more likely to be avoided (Wang, Zhang, & Zhai, 2017). This divergence is not a matter of simply accepting or rejecting sources; rather, it is the concrete manifestation of IH as a quality-filtering mechanism operating within an institutionalized source structure. We therefore propose a second set of hypotheses:

H2a: Intellectual humility significantly and positively predicts individual preference for formal information sources.

H2b: Intellectual humility significantly and negatively predicts individual preference for informal information sources.

2.3 The Need for Cognitive Closure: The Psychological Mechanism Behind the Pursuit of Certainty

If the two source types respectively carry a "certainty one can trust" and a "certainty one can feel," one question naturally follows: what psychological motive drives the pursuit of certainty in the first place? The Need for Cognitive Closure (NFCC) provides the key construct here. Kruglanski and Webster (1996) define NFCC as the individual's internal motivation to seek definitive answers in order to terminate states of ambiguity and uncertainty. It comprises two dimensions: decisiveness, the tendency to quickly seize and hold onto clear answers, and need for structure, the tendency to maintain one's existing views and reject information that challenges them. NFCC thus offers a classic operationalization of the motivational pursuit of certainty and supplies the micro-psychological mechanism that explains why individuals cling to subjective certainty even when evidence is insufficient.

Unable to tolerate ambiguity, high-NFCC individuals gravitate toward sources that deliver quick, simple, pointed positions aligned with their existing views, and they more readily favor informal, fragmentary channels that nonetheless offer clear-cut conclusions. Low-NFCC individuals, by contrast, are more tolerant of ambiguity and willing to engage in systematic, central-route processing, making them better suited to the depth and rigor of formal sources (Dijksterhuis et al., 1996). In other words, NFCC directly shapes the certainty ecology an individual inhabits. High-closure individuals seek an immediate, feel-based certainty in emotionally charged, conclusion-driven sources, while low-closure individuals wait for a trust-based certainty in institutionalized, deliberative ones.

What, then, is the relationship between IH and NFCC? Intuitively, the two should be inversely associated: the intellectually humble embrace the complexity of knowledge, and their high tolerance for ambiguity is precisely a hallmark of low NFCC. Yet this "humility equals tolerance of ambiguity" inference overlooks one critical context: the dual cognitive demand embedded in academic training. Highly educated individuals are routinely asked to do two seemingly contradictory things at once: to recognize the vastness of knowledge and the limits of their own, while at the same time supplying precise, rigorous answers to complex problems. This dual demand may produce a counterintuitive alignment between IH and NFCC, in which IH no longer signifies contentment with ambiguity but, following the acknowledgment of one's limits, generates a stronger motivation to find reliable answers and thereby dispel the anxiety born of self-aware ignorance. If this reasoning holds, it aligns closely with the anxiety-of-the-humble hypothesis: the more keenly one perceives the boundaries of one's knowledge, the less tolerable the epistemic discomfort those boundaries produce.

H3a: The need for cognitive closure is negatively correlated with intellectual humility.

H3b: The need for cognitive closure is positively correlated with intellectual humility.

H4a: Individual preference for formal sources is negatively correlated with the need for cognitive closure.

H4b: Individual preference for informal sources is positively correlated with the need for cognitive closure.

Through the joint testing of H3 and H4, this study further examines whether NFCC mediates the effect of IH on source selection.

2.4 A Person-Centered Perspective: Identifying the Psychological Profiles of False Confidence

The preceding three subsections, grounded in a variable-centered analytic approach, have examined the linear relationships among IH, source preferences, and NFCC. The strength of this approach lies in revealing the average effects among variables, but it carries an inherent limitation: it assumes that psychological traits act on behavior in mutually independent ways, and through averaging it obscures heterogeneity across subgroups. In practice, individual information decisions are rarely driven in a linear fashion by a single trait; far more often they are the product of multiple traits (meta-cognitive virtues, motivational dispositions, social trust, self-efficacy) acting jointly in specific configurations. An identical level of IH, for instance, may lead to entirely different source choices in individuals whose government trust diverges sharply.

For the study of false confidence and misplaced certainty, the methodological value of a person-centered perspective is especially pronounced. False confidence is never the product of any single trait; it is the structural product of multiple traits arranged in specific configurations. An individual who holds strongly misplaced certainty on a given issue may simultaneously exhibit relatively low IH, high government trust, a low sense of control, and a strong preference for quick conclusions. No single trait in isolation is sufficient to constitute false confidence, yet a particular configuration of them can form a stable psychological profile of it (Bowes et al., 2022; Gollwitzer et al., 2022; Meyer, 2019).

On this basis, the present study introduces four key variables to construct a user typology. IH and NFCC, as the core meta-cognitive and motivational traits, have been fully discussed above. Government trust, as a key dimension of social trust, captures an individual's baseline attitude toward the providers of institutionalized information (Huang & Wang, 2021) and is a crucial socio-psychological variable shaping source preference. Sense of control, defined as the individual's subjective perception of the extent to which they govern their own life and environment (Kraus et al., 2011), bears on the psychological-resource state with which one confronts uncertain information environments; those with a low sense of control tend to rely more heavily on external authority to compensate for the lack of internal mastery. Taken together, these four variables cover the principal psychological dimensions involved in information decisions and constitute the minimal sufficient variable set for identifying the prototypical profiles of false confidence. We accordingly pose two exploratory research questions:

RQ1: Based on the four variables of IH, NFCC, government trust, and sense of control, what prototypical user groups can be identified?

RQ2: Do these groups differ significantly in breadth of source exposure and in source preferences?

3. Methods

3.1 Sample and Procedure

This study conducted a cross-sectional online survey among Chinese adults from February 13, 2022, to March 25, 2022, using Sojump, a top Chinese professional online survey provider with a sampling service of 2.6 million registered users. In order to ensure the quality, we added screener questions and reverse questions. A total of 689 survey invitations to answer questionnaires were randomly sent out. We excluded unqualified questionnaires (those with less than 3 min to answer and those that did not pass the screener and reverse questions) and finally obtained a valid sample of 519, with an effective response rate of 75.3%. Upon completion, respondents received a gift of approximately one dollar as an incentive. Back-translation and pilot tests were conducted before the survey started. This study was approved by the Social Science Ethics Committee of a research university in Beijing, China (approval number: UCASS202201).

A total of 519 valid responses were collected through an online survey platform; the demographic characteristics of the sample are presented in Table 1. Notably, the sample is skewed toward higher education (87.6% hold a bachelor's degree or above), a distribution that aligns with the study's theoretical orientation. The anxiety-of-the-humble hypothesis assumes that individuals are simultaneously trained to acknowledge the limits of their knowledge and to pursue precise answers; this mechanism is expected to be most visible among those with systematic academic training. This feature of the sample thus provides a well-matched observational window for testing the core hypotheses, while also constraining the direct generalizability of the findings to less-educated populations.

The study unfolds in four progressive stages. Study 1 examines the relationship between IH and the breadth of source exposure. Study 2 disaggregates sources into formal and informal categories to test IH's differentiated preferences. Study 3 uses PLS-SEM and moderated regression to probe the psychological mechanism through which NFCC operates between IH and source preferences. Study 4 applies K-means cluster analysis to identify a typology of psychological profiles.

Table 1. Demographic Characteristics of the Sample

Variable	Category	Frequency	Percentage (%)
Gender	Male	232	44.7
	Female	287	55.3
Age	18-24	69	13.3
	25-30	216	41.6
	31-40	185	35.7
	41-50	41	7.9
	51 and above	8	1.5
Education	High school or below	22	4.3
	Associate degree	42	8.1
	Bachelor's degree	404	77.8
	Master's degree or above	51	9.8
Occupation	Government organs	46	8.9
	Corporate employees	117	22.5
	Industrial workers	291	56.1
	Freelancers	40	7.7
	Other	25	4.8
Region	Rural areas and townships	54	10.4
	County-level cities	64	12.3
	Prefecture-level cities	119	22.9
	Provincial capitals	181	34.9
	Municipalities directly under central government	99	19.1
	Overseas	2	0.4
Annual Income	Below ¥90,000	75	14.5
	¥90,000–180,000	207	39.9
	Above ¥180,000	237	45.7

3.2 Measures.

Intellectual humility was measured using the Comprehensive Intellectual Humility Scale (CIHS) developed by Krumrei-Mancuso and Rouse (2016); the Chinese version was adapted and validated by

Han and Liu (2021) with satisfactory reliability and validity. The scale contains 22 items across four sub-dimensions: independence of intellect and ego (IH1), openness to revising one's viewpoint (IH2), respect for others' viewpoints (IH3), and lack of intellectual overconfidence (IH4). Items were rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), with reverse-coded items recoded accordingly (α = .776).

Source exposure was measured with reference to Chu (2020) and Wang & Jin (2019), covering ten channels of information acquisition: (1) websites, apps, and affiliated social-media accounts of central-level authoritative media (e.g., *People's Daily, Xinhua News Agency, CCTV*); (2) websites and apps of local media (e.g., *Beijing Satellite TV, Hubei Daily*); (3) commercial and market-oriented news websites and apps (e.g., *Toutiao, Tencent News*); (4) family and friends; (5) WeChat; (6) Weibo; (7) online video and short-video platforms (e.g., Bilibili, Douyin); (8) online forum communities (e.g., Douban, Zhihu, Tieba); (9) search engines; and (10) overseas media. Each item was rated on a 5-point Likert scale (1 = never, 2 = rarely, 3 = sometimes, 4 = often, 5 = always). For each respondent, exposure scores below 3 were recoded as 0 and scores of 3 or above as 1; the sum across the ten channels was taken as the breadth of source exposure. Following Chu (2020) and Du et al. (2021), channels (1) and (2) were classified as formal sources, and channels (3)–(10) as informal sources.

Need for cognitive closure was measured with the scale translated and adapted to the Chinese context by Liu (2007), comprising 14 items across two dimensions: need for structure (items 1–7) and decisiveness (items 8–14). Items were rated on a 5-point Likert scale (1 = strongly disagree, 5 = strongly agree), with reverse-coded items recoded accordingly (α = .887).

Sense of control was measured following Kraus et al. (2011), operationalized through two dimensions: personal mastery (4 items) and perceived constraints (8 items), for a total of 12 items. Items were rated on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree), with reverse-coded items adjusted accordingly (α = .868).

Government trust was measured following the social-trust framework of Huang and Wang (2021), which encompasses media trust, expert trust, and government trust. The present study focused on government trust, using a 6-item scale rated on a 7-point Likert scale (α = .859).

All scales demonstrated satisfactory internal consistency, as summarized in Table 2 below.

Table 2. Descriptive Statistics and Reliability of Key Variables

Variable	*M*	*SD*	*Cronbach's α*
Intellectual Humility (22 items)	3.535	.393	.776
Need for Cognitive Closure (14 items)	3.441	.552	.887
Sense of Control (12 items)	4.654	.929	.868
Government Trust (6 items)	5.435	.906	.859

4. Results

4.1 Study 1: Intellectual Humility and the Breadth of Source Exposure

This section examines the relationship between intellectual humility and the breadth of individual source exposure, in order to test the directional hypotheses H1a and H1b. A hierarchical linear regression was conducted, with Model 1 in Table 3 including only demographic control variables, and Model 2 additionally introducing the focal predictor, intellectual humility.

As shown in Table 3, after controlling for gender, age, and education, intellectual humility negatively and significantly predicted the breadth of source exposure ($\beta = -0.126$, $p < .01$). *That* is, the higher an individual's level of intellectual humility, the fewer types of information channels they engaged with in daily life. Hypothesis H1b was therefore supported, while H1a was not. This preliminary finding points to a more complex relationship between intellectual humility and information behavior: high-IH individuals appear to favor a selective, quality-oriented strategy rather than a wide-net approach to information exposure.

Table 3. Hierarchical Regression: Intellectual Humility Predicting Breadth of Source Exposure

Variable	Breadth of Source Exposure	
	Model 1 (β)	Model 2 (β)
	β	
Demographics		
Gender (ref. = Male)		
Female	.066	.106
Age	-.057	-.057
Education (ref. = Bachelor's degree)		
High school or below	-.006	-.007
Associate degree	.029	.023
Master's degree or above	-.026	-.025
Income	.079	.094*
Predictor		
Intellectual Humility		-.126**
Model Statistics		
Adjusted R^2	.002	.016
ΔR^2	.014	.016
ΔF	1.194	8.179**

*Note. *p < .05, **p < .01, ***p < .001.*

4.2 Study 2: Intellectual Humility and Source-Selection Preferences

As shown in Table 4, intellectual humility significantly and positively predicted individual preference for formal information sources (β = 0.189, p < .001): the higher an individual's level of intellectual humility, the stronger their preference for authoritative, professional, formal sources. Hypothesis H2a was therefore supported. At the same time, intellectual humility significantly and negatively predicted individual preference for informal information sources (β = –0.160, *p < .001*), indicating that high-IH individuals tended to avoid personalized, socially mediated informal channels. Hypothesis H2b was therefore supported.

Table 4. Hierarchical Regression: Intellectual Humility Predicting Source-Type Preferences

Variable	Formal Sources		Informal Sources	
	Model 1 (β)	Model 2 (β)	Model 3 (β)	Model 4 (β)
	β			
Demographics				
Gender (ref. = Male)				
Female	.071	.074	-.031	-.034
Age	-.076	-.075	-.002	-.003
Education (ref. = Bachelor's degree)				
High school or below	-.059	-.057	.048	.046
Associate degree	.040	.049	.028	.020
Master's degree or above	-.133**	-.133**	.016	.016
Income	.155***	.133**	-.026	-.008
Predictor				
Intellectual Humility		.189***		-.160***
Model Statistics				
Adjusted R^2	.042	.076	-.006	.017
ΔR^2	.053	.035	.005	.025
ΔF	4.769***	19.769***	.460	13.300***

*Note. *p < .05, **p < .01, ***p < .001.*

4.3 Study 3: The Psychological Mechanism Underlying Source-Selection Preferences

Having established in Studies 1 and 2 the stable direct effects of intellectual humility on source selection, Study 3 systematically examines whether the Need for Cognitive Closure (NFCC), as a key cognitive variable, plays a mediating or moderating role in this relationship.

As a preliminary step, we first verified the relationship between the independent variable and the proposed mediator (H3). Regression analysis showed that intellectual humility significantly and positively predicted individual NFCC (β = .139, *p < .05*). In other words, the more keenly individuals recognized the limits of their knowledge, the more they craved a definitive, clear-cut answer that could terminate uncertainty. Hypothesis H3b was thus supported. Because source selection in this study is specified as a formative construct while intellectual humility and NFCC are reflective constructs, we adopted Partial Least Squares Structural Equation Modeling (PLS-SEM) for model testing. As a variance-based SEM technique, PLS is better suited to the present analysis than conventional covariance-based

SEM. Path-relationship hypotheses were tested via bootstrap resampling, with 5,000 subsamples (Hair et al., 2017). In addition, we conducted Harman's single-factor test to assess common method bias. The unrotated factor analysis showed that the first factor accounted for 13.479% of the variance well below the conventional 40% threshold, indicating no substantial concern regarding common method bias.

Results indicated that the indirect effect of NFCC between intellectual humility and preference for formal sources was not significant (indirect effect = .001, t = 0.043, 95% CI [–.041, .050]). Likewise, the indirect effect between intellectual humility and preference for informal sources was not significant (indirect effect = .009, t = 0.236, 95% CI [–.081, .058]). Because both 95% confidence intervals contained zero, the mediating effect of NFCC was not established.

Given that the mediating path did not hold, we next explored the possibility of NFCC serving as a moderator, testing whether it altered the strength of intellectual humility's effect on source preferences. To this end, we constructed moderated regression models with preference for formal and informal sources as the dependent variables; after controlling for demographic variables, intellectual humility, NFCC, and their mean-centered interaction term were entered as predictors. Results showed that for preference for formal sources, the "Intellectual Humility × NFCC" interaction was not significant (β = .054, *p = .233*). The interaction was likewise not significant for preference for informal sources (β = –.056, *p = .224*).

Taken together, intellectual humility and NFCC showed a positive association contrary to theoretical expectation, while the simple mediating path of NFCC did not hold, suggesting that variable-centered linear models may be unable to capture the complex interplay between these two traits. These null findings actually reveal that the direct effect of intellectual humility on source selection is robust, and that the psychological mechanism behind it is likely more complex than any single cognitive motive: it is the joint product of multiple psychological traits acting in concert. The variable-centered approach adopted thus far may therefore be inherently limited in its attempt to disassemble and linearize these traits. To genuinely understand how these psychological traits shape individual behavior holistically and in combination, the analytic perspective shifts in what follows to a person-centered approach, using cluster analysis to identify prototypical user profiles formed by different configurations of psychological traits and to examine how such configurations translate into distinct patterns of information behavior.

4.4 Study 4: Group-Level Cluster Profiles

To identify distinct respondent profiles, we conducted K-means cluster analysis on four composite variables: total intellectual humility (IH), the need for cognitive closure (NFCC), government trust, and sense of control. Government trust and sense of control, originally measured on 7-point scales, were first rescaled to a common 5-point metric; all four composite variables were then z-standardized prior to clustering. The four IH sub-dimensions (IH1–IH4) were not entered into the clustering algorithm, so as to avoid over-weighting the IH construct in the Euclidean distance computation; they are reported in Table 5 solely for descriptive characterization of the resulting clusters.

The optimal number of clusters was determined by jointly evaluating within-cluster cohesion and between-cluster separation across candidate solutions from two to six clusters. The four-cluster solution was selected as both statistically robust and theoretically the most interpretable. Cluster quality was verified through ANOVA: each of the four clustering variables differed significantly across clusters (all *ps* < .001), confirming that the solution captures meaningful heterogeneity within the sample. For descriptive completeness, the IH sub-dimensions also differed significantly across the four clusters (all *ps* < .001).

Table 5. K-Means Cluster Analysis: Standardized Cluster Centers

Variable	Cluster 1 (n=167)	Cluster 2 (n=160)	Cluster 3 (n=71)	Cluster 4 (n=118)
IH1 (Independence of Intellect and Ego)	-.755	.968	-.447	.036
IH2 (Openness to Revising Viewpoints)	.234	.464	-1.302	-.145
IH3 (Respect for Others' Viewpoints)	.061	.674	-1.644	.030
IH4 (Lack of Intellectual Overconfidence)	-.705	.400	-.316	.653
IH Total	-.603	1.049	-1.279	.233
Government Trust	.361	.623	-.933	-.770
Sense of Control	-.233	.887	-.585	-.506
Need for Cognitive Closure	.140	.276	-.439	-.296
Profile Label	Certain Dependents	Reflective Rationalists	Disengaged Cynics	Vigilant Skeptics

The **Certain Dependents** are characterized by a certainty-driven orientation. This group exhibits above-average government trust (0.361) and markedly below-average intellectual humility (–0.603), with particularly low scores on several IH sub-dimensions (IH1 = –0.755; IH4 = –0.705). Their NFCC hovers near the mean (0.140), and their sense of control is slightly below average (–0.233). They lack intellectual humility and are reluctant to acknowledge the limits of their own knowledge, yet their low sense of control leaves them feeling helpless and anxious. To dispel this uncertainty, they are strongly motivated to seek a clear and simple answer, turning to rapidly accessible information as a route to felt certainty. Likely lacking the capacity for deeper reflection, they are the "trusting but unreflective" type, gravitating exclusively toward authoritative sources that deliver the certainty they crave.

The **Reflective Rationalists** score exceptionally high on all adaptive variables: intellectual humility (1.049) and each of its sub-dimensions, sense of control (0.887), and government trust (0.623), all exceed the mean. Their NFCC is also above average (0.276), though this likely reflects high confidence

and decisiveness rather than mere closed-mindedness. This profile represents the ideal civic personality envisioned by virtue epistemology: they recognize the limits of their own knowledge yet feel confident and secure in navigating the information environment, remaining open to complex and ambiguous information. They exemplify a confident, engaged, and capacious mindset.

The **Disengaged Cynics** score extremely low across the board: government trust (–0.933), sense of control (–0.585), NFCC (–0.439), and intellectual humility (–1.279), along with all of its sub-dimensions, fall well below the mean. They neither believe in themselves nor trust any external authority, and they show little motivation to pursue definitive answers. This likely stems from a generalized sense of powerlessness and negative affect that has fundamentally extinguished their interest in information acquisition and cognitive engagement. They are the most alienated and disengaged group, and, though smallest in size, the most extreme in profile.

The **Vigilant Skeptics** display a markedly ambivalent psychological pattern: overall intellectual humility (0.233) is slightly above average, and IH4 (0.653; lack of intellectual overconfidence) is the highest of all sub-dimensions. Government trust (–0.770), sense of control (–0.506), and NFCC (–0.296) all fall substantially below the mean. This group harbors strong skepticism toward external authority and a sense of helplessness. Unlike the Disengaged Cynics, however, they retain average levels of intellectual humility and relatively low NFCC. This suggests that they do not rigidly cling to their own views, yet they are also unwilling to trust any source readily. Their humility appears to operate more at the interpersonal than the institutional level, leaving them in a posture of watchful ambivalence: neither actively pursuing closure, nor readily accepting the closure offered by authority.

After the clusters were established and the group profiles characterized, chi-square tests of independence were conducted to examine demographic differences across clusters. Results showed significant differences in annual-income distribution across clusters ($\chi^2(27) = 41.63$, $p = .036$, Cramer's V = .16). Specifically, the Reflective Rationalists contained a relatively higher proportion of high-income respondents, whereas the Disengaged Cynics contained a relatively higher proportion of low-income respondents. The effect size indicated only a weak association between income and cluster membership, and no other demographic variables reached significance.

One-way ANOVAs were conducted to test whether the clusters differed in their source-selection behavior. The clusters differed significantly in their use of both formal ($F(3, 515) = 11.059$, $p < .001$) and informal sources ($F(3, 515) = 4.141$, $p < .001$).

Table 6. Post-hoc Comparisons (Tamhane's T2): Source Use Across Clusters

Dependent Variable	Group Comparison	Mean Difference (I – J)	Significance
Formal Sources	Cluster 1<Cluster 2	-0.525	***
	Cluster 2>Cluster 3	0.747	***
	Cluster 2>Cluster 4	0.660	***
Informal Sources	Cluster 1>Cluster 2	0.313	**

Note. Cluster 1 = Certain Dependents; Cluster 2 = Reflective Rationalists; Cluster 3 = Disengaged Cynics; Cluster 4 = Vigilant Skeptics. *p < .05, **p < .01, ***p < .001.

Post-hoc comparisons using Tamhane's T2 revealed that the Reflective Rationalists (Cluster 2) used formal sources significantly more often than the Certain Dependents (Cluster 1; p < .001), the Disengaged Cynics (Cluster 3; p < .001), and the Vigilant Skeptics (Cluster 4; p < .001). Conversely, the Certain Dependents (Cluster 1) used informal sources significantly more often than the Reflective Rationalists (Cluster 2; p = .004).

These findings strongly support the validity of the cluster solution and reveal that different configurations of psychological traits give rise to sharply divergent patterns of information selection: individuals combining metacognitive capacity with institutional trust make reasoned choices in favor of authoritative sources, whereas those high in trust but lacking such capacity rely instead on more readily available informal channels.

5. Discussion

5.1 Summary of Findings

Through a four-stage progressive design, this study systematically examined the role of intellectual humility in information decision-making and yielded three sets of interrelated, mutually resonant findings. First, contrary to the behavioral expectation of openness promised by the virtue-epistemology tradition, intellectual humility was significantly and negatively associated with the breadth of source exposure (β = –.126, p < .01). The more keenly individuals were aware of their own epistemic limits, the more decisively they narrowed the range of channels they consulted.

Second, this narrowing did not reflect cognitive closure; it was a deliberate quality-first filtering strategy. Intellectual humility significantly and positively predicted preference for formal sources (β = .189, p < .001), while significantly and negatively predicted preference for informal sources (β = –.160, p < .001).

Third, contrary to the conventional intuition that "humility equals tolerance of ambiguity," intellectual humility was significantly and positively correlated with the need for cognitive closure (β = .139, p < .05). Among the highly educated, self-aware ignorance did not breed contentment with uncertainty but, on the contrary, intensified the motivation to seek definitive answers. Neither the mediating nor the moderating

effect of NFCC, however, was supported—a pattern suggesting that variable-level linear models cannot fully capture the ways in which these psychological traits work in concert. The analysis therefore turned to a person-centered typology, identifying four prototypical profiles—Certain Dependents, Reflective Rationalists, Disengaged Cynics, and Vigilant Skeptics—that display distinctly different configurations across intellectual humility, NFCC, government trust, and sense of control, and that translate directly into divergent patterns of source selection. Taken together, these findings sketch a more complex picture than existing linear expectations allow: intellectual humility is not a direct route to openness, but a metacognitive decision mechanism through which individuals, having clearly perceived the boundaries of their own knowledge, actively filter information by quality.

5.2 Theoretical Contributions

The first theoretical contribution of this study lies in the reconceptualization of intellectual humility itself. The virtue-epistemology tradition has long treated intellectual humility as a cognitive virtue that fosters openness: one that should lead individuals to engage with more diverse information, read more varied viewpoints, and tolerate greater ambiguity (Bowes et al., 2022; Leary et al., 2017; Roberts & Wood, 2007). The empirical results of this study challenge that promise in a way unanticipated by conventional theory. High-IH individuals did not, upon acknowledging their own ignorance, turn to a wide-net mode of information seeking; rather, they clearly narrowed their channels and concentrated their attention on institutionalized formal sources subject to stringent editorial review. This finding provides the first systematic empirical validation of what we have termed the humility paradox: those most keenly aware of their own epistemic limits are precisely not those who remain equally open to all information. On the contrary, they draw a sharp line, in a highly selective manner, between a certainty one can trust and a certainty one can feel, refusing to let the latter stand in for the former. The true behavioral import of intellectual humility, then, is not to take in more but to filter more stringently; not to drift with the tide in an ocean of information, but to actively govern information quality once the boundaries of one's knowledge are clearly in view. We therefore argue that intellectual humility should be reconceptualized—from a virtue-epistemological commitment to breadth-based openness into a metacognitive decision mechanism that drives quality-based filtering. What matters is not whether one encounters much, but whether one chooses well.

The second theoretical contribution, and the study's central intervention in contemporary debates on false confidence and misplaced certainty, lies in uncovering a psychological pathway that the existing literature has overlooked. Prior work has converged on a reassuring expectation: if false confidence arises from the cognitive blindness of the overconfident (Meyer, 2019), then intellectual humility—by dismantling that blindness—should function as its antidote, fostering less biased reasoning (Bowes et al., 2022) and greater receptivity to dissenting evidence (Leary et al., 2017). Our findings do not overturn this expectation so much as reveal its incompleteness. Intellectual humility and the need for cognitive closure were positively—not negatively—associated ($\beta = .139$), and this positive link coexisted with the filtering pattern reported above. The humble in our sample are indeed less susceptible to the blunt forms of false confidence that preoccupy Meyer (2019) and Pennycook and Rand (2021); yet they remain

tethered to certainty in a subtler register. Alongside the well-documented pathway from overconfidence to misplaced certainty, our data reveal a second pathway: one that runs from the anxiety of the humble. When individuals are trained, academically and professionally, to meet a dual demand (acknowledging both the vastness of knowledge and the limits of their own, while also supplying precise, rigorous answers to complex problems), intellectual humility ceases to be a static virtue of contentment with ambiguity. It is transformed, instead, into a form of epistemic anxiety born of self-aware ignorance. To dispel that anxiety, individuals turn to external, institutionalized anchors of certainty, and formal sources —along with the authority systems that stand behind them—offer precisely such an anchor. This finding offers a critical corrective to the prevailing expectation of intellectual humility as a cognitive antidote: IH may well distance individuals from the false certainty of blind self-confidence. But it does not necessarily distance them from the pursuit of certainty itself. In today's saturated media ecology, the humble and the overconfident may inhabit different "certainty ecologies," yet neither can fully escape a psychological dependence on certainty in some form.

The third theoretical contribution lies in providing, through a person-centered typological analysis, a set of empirically grounded psychological prototypes that future research on misplaced certainty can take as reference. The four user types identified—Certain Dependents, Reflective Rationalists, Disengaged Cynics, and Vigilant Skeptics—exhibit significantly different configurations across four psychological dimensions (metacognitive virtue, certainty motivation, social trust, and self-efficacy) and translate directly into diverging source-selection behaviors. False confidence is never the product of any single trait; it is the structural product of multiple traits arrayed in specific configurations. Among these four profiles, the Certain Dependents particularly warrant elevation to the status of a prototypical psychological profile of misplaced certainty. This group forms a stable psychological structure out of low intellectual humility, high government trust, a somewhat diminished sense of control, and near-average NFCC. They lack the reflective capacity to scrutinize their own cognition, and their limited sense of control leaves them in need of an external anchor of certainty; they therefore turn to authoritative sources in search of a ready-made certainty onto which they can offload trust. This profile also highlights a broader configural logic: low intellectual humility may present as healthy self-confidence in those with high self-efficacy, and high government trust may translate into critical adoption in those with strong reflective capacity. It is only within the specific combination of these four variables that false confidence is generated as a stable psychological structure. In this sense, the study not only delivers a concrete typological result but also makes a methodological case: the study of misplaced certainty must move beyond variable-centered linear analysis toward a systematic characterization of the configural patterns of psychological traits.

5.3 Practical Implications

The findings of this study bear directly on paradigm choices in media-literacy education. Mainstream media-literacy education has long rested on a default assumption that broader information exposure yields better cognitive judgment, and has accordingly concentrated on encouraging students to engage diverse sources, avoid filter bubbles, and maintain an open attitude. In today's information ecology,

however, breadth alone is no longer a reliable indicator of cognitive resilience. High-IH individuals already narrow their channels spontaneously, concentrating on formal sources—an act that is not cognitive closure but an active filtering decision in an environment where truth and falsehood are difficult to distinguish. Rather than continuing to advocate for more exposure, educational practice should turn toward cultivating the public's capacity to appraise source quality and the metacognitive habit of scrutinizing the origins of one's own sense of certainty—the core capacity articulated in the introduction: helping the public recognize the psychological sources of their own felt certainty. For the Certain Dependents identified in this study, this shift is especially important: because they are unwilling to examine their own epistemic limits yet rely on authoritative sources for ready-made answers, simply increasing the range of information channels does little to improve their cognitive state and may instead deepen their passive dependence on authoritative voices. Interventions targeting this group should therefore focus on raising their levels of intellectual humility and self-efficacy, shifting them from "passively accepting certainty" to "actively interrogating certainty."

At the platform and governance level, the findings impose a dual requirement on both algorithmic-recommendation design and the rebuilding of public trust. At the algorithmic level, mainstream recommendation systems are largely built on users' existing interests, producing homogeneous personalized feeds (Bakshy et al., 2015; Loecherbach et al., 2020). From the vantage point of this study, such mechanisms carry an overlooked risk: they reinforce not merely filter bubbles but also users' pre-existing preferences in the sources of certainty. Users who favor informal sources are fed more informal sources, and those who favor immediate certainty are fed more emotionally charged conclusions—widening the gulf between different certainty ecologies. Equally, as generative-AI content permeates the public information space (Spitale et al., 2023), platforms bear a heightened responsibility to help high-NFCC and low-IH users avoid mistaking the surface certainty of AI-generated content for credible sources—through clear labeling, provenance-traceability mechanisms, and similar measures. A more publicly valuable approach to algorithmic design would be, in domains where users' knowledge is limited or susceptibility to misinformation is high, to actively break the preference loop and prioritize the recommendation of verified formal sources, helping users build more reliable epistemic frameworks. At the level of social governance, the Disengaged Cynics and Vigilant Skeptics identified in this study point to a structural dilemma. Given these groups' broad distrust of authoritative sources, traditional top-down modes of governance—authoritative releases and information dissemination—struggle to reach them, and mere content supply does not translate into cognitive uptake. This pattern is consistent with a broader finding in the trust literature: information supply enhances trust only when citizens already attribute competence and honesty to the source; where that baseline is absent, additional transparency can paradoxically deepen skepticism (Grimmelikhuijsen & Meijer, 2014; Porumbescu, 2015). Genuine reconstruction of public trust requires the simultaneous enhancement of institutional transparency and governance responsiveness, coupled with efforts to empower individuals' sense of control so as to alleviate their structural estrangement from authority. The latter is more than an abstract wellbeing concern: compensatory control theory holds that when personal control is threatened, individuals turn to external authorities—governments, institutions, hierarchies—to restore a sense of an orderly world (Kay

et al., 2008; Landau et al., 2015). Together, these practical implications converge on a deeper judgment: meeting the social challenge of misplaced certainty cannot remain at the level of information-layer interventions but must return to the very structural conditions that shape individuals' psychology of certainty.

5.4 Limitations and Future Research

Several limitations of this study warrant careful consideration. Methodologically, the sample consists predominantly of Chinese adults with relatively high educational attainment. This composition is theoretically well-suited to testing the counterintuitive "anxiety of the humble" hypothesis, as the hypothesized effects are expected to be most pronounced among those with systematic academic training; yet the sample's homogeneity correspondingly constrains the direct generalization of the findings to broader populations. The study also relies entirely on self-report questionnaires for its core variables, which poses a particular challenge for a metacognitive trait like intellectual humility. IH itself involves the ability to recognize one's own epistemic limits, yet those low in this ability may precisely—due to their very lack of self-awareness—overestimate it, producing what has been termed the self-attribution paradox (Clemente, 2024). Moreover, the cross-sectional design cannot establish the causal direction among variables, nor can it capture the dynamic co-evolution that psychological traits and source preferences may undergo over time.

At the theoretical and cross-contextual level, the source classification adopted here is built on the clear formal–informal binary characteristic of the Chinese media context. This structure offers unique conditions for testing IH's differentiated preferences, but in other media systems—such as the pluralistic public-media environments of Western democracies or the hybrid media ecologies of emerging markets—the boundary between the two types may be considerably more blurred. Whether the filtering mechanism identified here continues to hold awaits testing through cross-cultural comparative research. In addition, the present study has not systematically examined how the sub-dimensions of intellectual humility function differently across issue domains such as politics, science, health, and ethics, nor has it tested whether interventions targeting the Certain Dependents can effectively alter their information-decision patterns. Future research can employ multi-method measurement, longitudinal tracking, and intervention experiments to retest the mechanisms proposed here across more diverse populations and cultural contexts, and to translate the typological findings into operational tools for social practice.

Declarations

Data availability

The de-identified analysis dataset, a variable-level codebook, the English-language version of the survey instrument, and a README documenting de-identification procedures and scoring conventions are openly available in the Open Science Framework repository at https://osf.io/nswq4/?view_only=038824889b2340639602a34457681b3f. The variable-construction formulae, rescaling conventions, and composite-score definitions required to reproduce the reported analyses are

documented in the Notes sheet of the codebook and in the Methods section of this manuscript; the underlying analysis syntax is available from the corresponding author upon reasonable request. Sections of the original survey instrument that were collected as part of a broader data-collection project but are not analyzed in the present manuscript are listed by section heading in the appendix of the survey-instrument file and are not included in the released dataset.

Ethics declarations

Ethics approval and consent to participate. This study was reviewed and approved by the Academic Ethics Committee, School of Journalism and Communication, University of Chinese Academy of Social Sciences (approval number: UCASS202201). All procedures performed in this study were in accordance with the ethical standards of the institutional research committee and with the 1964 Declaration of Helsinki and its later amendments. Online informed consent was obtained from all individual adult participants included in the study prior to data collection.

Consent for publication. Not applicable. The manuscript does not contain any individual person's identifiable data.

Competing interests. The authors declare no competing interests.

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