Evaluation of Measure Invariance in the Generic Conspiracist Beliefs Scale

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PSYCH 315F: Factor Analysis

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March 9, 2023

Introduction

Conspiratorial thinking, or conspiratorial ideation, is at its core a problem of misattribution. Inaccurate judgments often arise when access to objective information is limited (either intentionally or unintentionally), as the relative impact of subjective biases is amplified. Because conspiracy theories are necessarily grounded in distrust, whether justified or not, denial by the alleged conspirator only reinforces the perception of deceit. While the psychological process of conspiratorial ideation is well studied, little research has been done to understand common themes in the content and scope of conspiracy theories, and how these qualities may differ between individuals. Two notable theoretical frameworks have been suggested by Walker and Barkun, respectively, to describe the structure underlying conspiratorial ideation. These frameworks, however, lack empirical support. Brotherton, French, & Pickering proposed and validated a structure of generic conspiratorial beliefs, which is explored at length here.

From a psychological perceptive, belief in conspiracy theories is thought to be the result of varied and largely intrinsic qualities of the individual. Subjectively negative psychological experiences, such as paranoia and interpersonal distrust, low self-esteem, and perceived powerlessness are all associated with conspiratorial ideation (Abalakina-Paap et al.,1998; Darwin et al., 2011; Cichocka et al. 2016). However, psychological experiences generally viewed as positive by the individual, such as narcissism, authoritarianism, and machiavellianism, are also associated with greater endorsement of conspiracy theories (Douglas & Sutton, 2011; Abalakina-Paap et al.,1998). Additionally, conspiratorial thinking is commonly seen in psychiatric conditions that result in atypical cognitive and perceptual experiences (Barron et al., 2018; Darwin et al., 2011).

A framework proposed by Jesse Walker, an American editor and author, addresses the content of conspiratorial thinking across five domains: Enemy Outside, Enemy Within, Enemy Above, Enemy Below, and Benevolent Conspiracies (Walker, 2013). The first four domains roughly describe external influence, deceit and betrayal, oppression by a few, and rebellion by the masses. The last domain is an inherently positive and nonspecific belief that “good forces” act covertly to better the world. Regarding the scope of conspiratorial thinking, Michael Barkun, a professor of political science at Syracuse University, suggested three classifications of conspiracy theories: Event Conspiracy Theories, Systemic Conspiracy Theories, and Superconspiracy

Theories (Barkun, 2003). Event theories deal with only localized, tangible occurrences (e.g., the moon landing, covid-19 lab leak). Systemic theories are more nebulous and assume broadly malevolent behavior from a particular organization. Lastly, Superconspiracy theories attempt to consolidate a number of disparate, lower order conspiracy theories under a unifying, hierarchical theory.

The framework developed by Brotherton, French, & Pickering identified five underlying factors of conspiracist beliefs: Government Malfeasance (GM), Extraterrestrial Cover-up (ET), Malevolent Global Conspiracies (MG), Personal Wellbeing (PW), and Control of Information (CI). In the context of Walker's and Barkun's respective frameworks, all items and factors of this model appear to be Enemy Above, Systemic beliefs, as the common theme appears to be oppression of the masses, executed by a small number of people, across a variety of nonspecific scenarios.

The aim of this analysis is to further explore the latent factor structure of conspiratorial beliefs and assess the multigroup validity of this original five-factor structure. Alternative models that better represent the latent factor structure of conspiratorial beliefs for men and women, respectively, are then proposed. The dataset used here was recently used in an analysis of gender differences in conspiratorial beliefs. The authors found significant differences in endorsement of all five facets, however their analysis focused only on differences in factor *score* by gender, not factor *structure*.

Methods

A dataset containing survey responses to a conspiratorial belief scale (Generic Conspiracist Beliefs Scale; GCBS), abbreviated personality inventory (Ten Item Personality Inventory; TIPI), and 13 general demographic questions was downloaded from the Open Source Psychometric Project. The original dataset contained 2,495 observations. Of the variables relevant to this analysis, 101 observations contained missing values. These rows were removed, leaving 2,394 observations. Of the 105 unique correlations between items, 104 (99.05%) were greater than or equal to .3 (Table 1). Statical assumptions were checked before conducing the analysis. Homoscedasticity was violated, as indicated by a significant Breusch–Pagan test, $X^2(1)=111.88$, $p<.001$. One item demonstrated mild nonnormality (q15); no other items had a skewness or kurtosis greater than 1 or 3, respectively. Multivariate normality was also violated ($HZ=4.87$, $p<.05$). Identification and removal of

140 multivariate outliers in the top percent did not resolve nonnormality (*HZ*=4.74, p<.05). Outliers were kept, as their removal was not useful, and the Robust Maximum Likelihood estimation was used to address multivariate nonnormality. Factor loadings were standardized by setting the variance of latent factors to 1.

Results

The original five-factor solution found by Brotherton, French, & Pickering was specified (Table 2, Figure 1). While this factor structure significantly differed from the observed covariances of the items, $X^2(80)=530.56$, p<.001 (X^2:df ratio of 6.63), it demonstrated good fit on all other indices. A robust CFI of .98 and TLI of .97 indicated good incremental fit; a scaled RMSEA of .05 and SRMR of .03 indicated good absolute fit. The AIC of this model was 105018.21. All factors were correlated, particularly "Personal Wellbeing" and "Control of Information" with "Government Malfeasance," (*r*=.86, *r*=.89), which were also strongly correlated with one another (*r*=.88). This indicated a high degree of conceptual overlap between these three factors.

Table 2
Factor Pattern for CFA of Original GCBS Structure

Item	Factor loading					h^2
	1	2	3	4	5	
Factor GM						
q1	**.79**					.38
q6	**.80**					.36
q11	**.80**					.35
Factor MG						
q2		**.82**				.33
q7		**.84**				.29
q12		**.90**				.18
Factor ET						
q3			**.86**			.27
q8			**.91**			.36
q13			**.86**			.48
Factor PW						
q4				**.80**		.41
q9				**.72**		.46
q14				**.77**		.63
Factor CI						
q5					**.74**	.46
q10					.61	**.63**
q15					.65	.57

Note. N = 2,394. Robust Maximum Likelihood method was used. Factor loadings above .70, and unique variances greater than the associated item's factor loading are bolded. GM = Government Maleficence, MG = Malevolent Global Conspiracy, ET = Extraterrestrial Cover-up, PW = Personal Wellbeing, CI = Control of Information.

Figure 1

Original Latent Factor Structure of GCBS

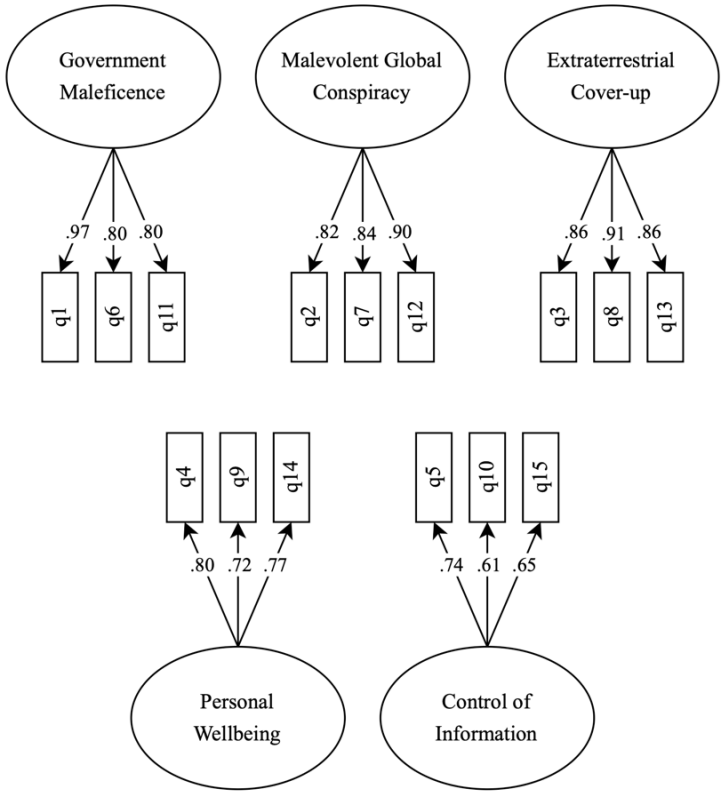


Table 3

List of GCBS Items

1	The government is involved in the murder of innocent citizens and/or well-Known public figures, and keeps this a secret.
2	The power held by heads of state is second to that of small unknown groups who really control world politics.
3	Secret organizations communicate with extraterrestrials, but keep this fact from the public.
4	The spread of certain viruses and/or diseases is the result of the deliberate, concealed efforts of some organization.
5	Groups of scientists manipulate, fabricate, or suppress evidence in order to deceive the public.
6	The government permits or perpetrates acts of terrorism on its own soil, disguising its involvement.
7	A small, secret group of people is responsible for making all major world decisions, such as going to war.
8	Evidence of alien contact is being concealed from the public.
9	Technology with mind-control capacities is used on people without their knowledge.
10	New and advanced technology which would harm current industry is being suppressed.
11	The government uses people as patsies to hide its involvement in criminal activity.
12	Certain significant events have been the result of the activity of a small group who secretly manipulate world events.
13	Some UFO sightings and rumors are planned or staged in order to distract the public from real alien contact.
14	Experiments involving new drugs or technologies are routinely carried out on the public without their knowledge or consent.
15	A lot of important information is deliberately concealed from the public out of self-interest.

Modified Structure

Despite good overall fit, a second structure was attempted to further explore the similarity between factors. Of the three most strongly correlated factors, semantic and thematic qualities of items were subjectively assessed (list of items can be found in Table 3). Two items from "Control of Information" (q5 and q10) were moved to "Personal Welling," which can now be more accurately named "Harmful Science and Technology." This left only one item in "Control of Information" (q15), which was moved to "Government Malfeasance," now more aptly named "Nefarious Public Relations" (Table 4, Figure 2).

Apart from a slightly higher AIC (105048.51) and chi-square statistic to degrees of freedom ratio $X^2(84)= 564.07$, $p<.001$ (X^2:df ratio of 6.72), the fit of this four-factor solution did not differ from the previous model (robust CFI of .98 and TLI of .97; scaled RMSEA of .05 and SRMR of .03). This model effectively consolidates three strongly correlated factors into two, demonstrating greater parsimony than the five-factor model without sacrificing utility.

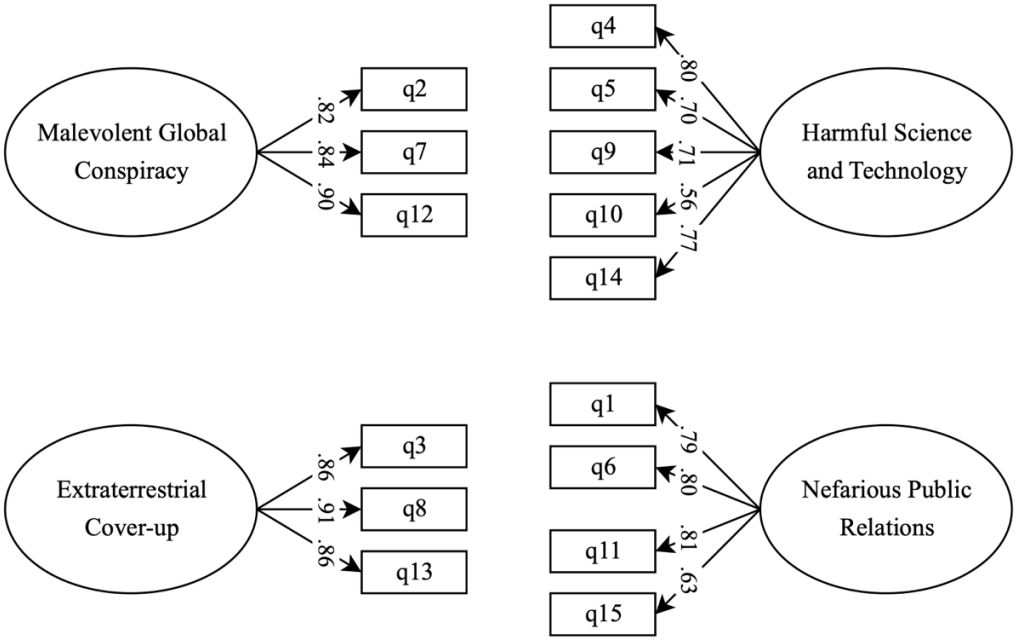
Table 4

Factor Pattern for CFA of Modified GCBS Structure

Item	Factor loading				h^2
	1	2	3	4	
Factor ST					
q4	**.80**				.37
q5	**.70**				.50
q9	**.71**				.49
q10	.56				**.69**
q14	**.77**				.41
Factor PR					
q1		**.79**			.38
q6		**.80**			.36
q11		**.81**			.35
q15		.63			.60
Factor GM					
q2			**.82**		.33
q7			**.84**		.29
q12			**.90**		.19
Factor ET					
q3				**.86**	.26
q8				**.91**	.18
q13				**.86**	.27

Note. N = 2,394. Robust Maximum Likelihood method was used. Factor loadings above .70, and unique variances greater than the associated item's factor loading are bolded. ST = Harmful Science and Technology, PR = Nefarious Public Relations, MG = Malevolent Global Conspiracy, ET = Extraterrestrial Cover-up.

Figure 2
Modified Latent Factor Structure of GCBS



Additionally, factors "Harmful Science and Technology" and "Nefarious Public Relations" introduce an element of intent that was largely absent in the original five-factor structure. The items in "Harmful Science and Technology" mostly describe the use of harmful science and technology without ascribing motivation; bad things are simply happening. Conversely, items in "Nefarious Public Relations" specifically assert premeditation and misdirection, presumably with the goal of maintaining favorable optics.

Multigroup CFA

Using a fixed sequence of model comparison tests, multigroup confirmatory factor analyses were used to determine whether the response pattern to the original five-factor and modified four-factor GCBS differed by gender. Tests of configural, metric, and scalar equivalency differed significantly for both the original and modified structure (Table 5, Table 6), indicating that not only do item means and loadings depend on gender, but the entire latent factor structure of Conspiracist Beliefs differs between men and women. To determine alterative solutions which could better describe the latent factor structure of conspiratorial ideation for each gender, two exploratory factor analyses were conducted. The dataset was subtest by gender (1183 men, 1086 women). Statistical assumptions of exploratory factor analysis were assessed for both groups prior to the respective analyses.

Table 5

Multigroup CFA Model Comparison of Original Structure

Model	df	AIC	BIC	χ2	χ2 Dif	df Dif
1: fitconf	160	99372	100002	751.01		
2: fitmet	170	99370	99943	769.57	22.44*	10
3: fitscal	180	99399	99914	818.20	52.37***	10
4. fitstrict	195	99494	99924	943.19	84.69***	15

Note. Multigroup Confirmatory Factor Analysis was used to assess the degree of measurement invariance due to gender differences. Fitconf = configural invariance, fitmet = metric invariance, fitscal = scalar invariance, fitstrict = strict invariance. AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion.
* indicates $p < .05$, ** indicates $p < .01$, *** indicates $p < .001$.

Table 6

Multigroup CFA Model Comparison of Modified Structure

Model	df	AIC	BIC	χ2	χ2 Dif	df Dif
1: fitconf	168	99396	99980	790.87		
2: fitmet	179	99394	99915	810.70	23.73*	11
3: fitscal	190	99414	99873	853.64	45.56***	11
4. fitstrict	205	99890	99890	986.91	92.03***	15

Note. Multigroup Confirmatory Factor Analysis was used to assess the degree of measurement invariance due to gender differences. Fitconf = configural invariance, fitmet = metric invariance, fitscal = scalar invariance, fitstrict = strict invariance. AIC = Akaike Information Criterion, BIC = Bayesian Information Criterion.
* indicates $p < .05$, ** indicates $p < .01$, *** indicates $p < .001$.

Alternative Factor Structure for Men

Neither univariate or multivariate normality were met; *HZ*=3.60, p<.05. Of the 105 item correlations, 102 (97.14%) were stronger than .3 and all were significant (Table 7). Bartlett's test of sphericity confirmed that the correlation matrix was not random, $X^2(105)= 12289.02$, p<.001, and a small though nonzero determinant of 2.90e-5 suggested that extreme multicollinearity was not a concern. A KMO statistic of .95 indicated sampling adequacy, as it exceeded the recommended minimum value (.50-.70).

A parallel analysis was conducted, suggesting the extraction of four factors, rather than five factors as specified in the original GCBS. Factors were allowed to correlate using an Promax rotation. Principal Axis Factoring was chosen as the extraction method, as it does not assume multivariate normality. A cutoff of .4 was used to define salient loadings. The resulting solution accounted for 66 percent of variance in item responses among men and demonstrated good absolute fit (RMSEA of .02 and RMSE of .01). All items saliently loaded onto just one of the four factors. The clean factor pattern and visualization for this group-specific structure can be found in Table 8 and Figure 3, respectively.

Table 8

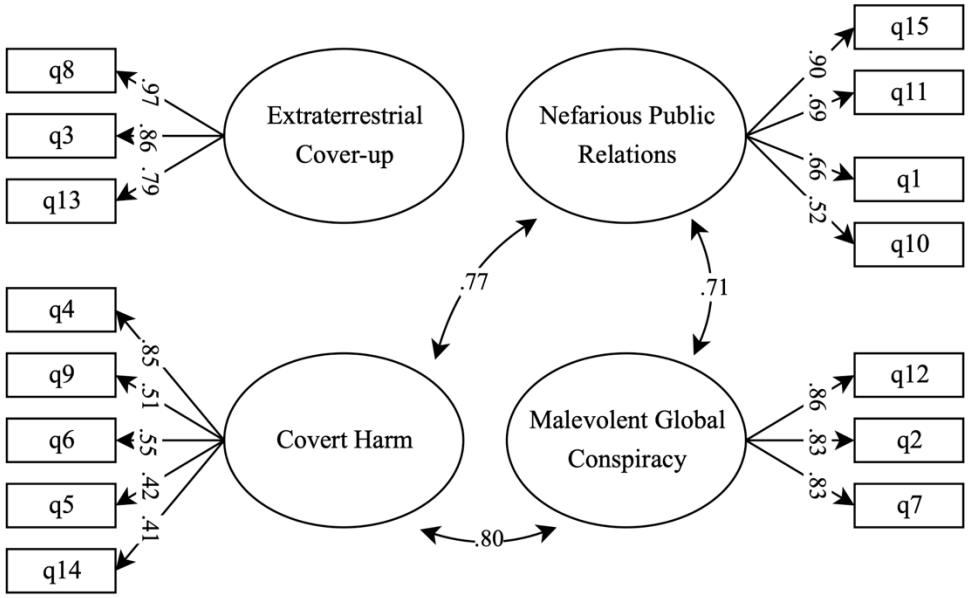
Clean Factor Pattern for EFA of GCBS Items, Men

Item	Factor loading				h^2
	1	2	3	4	
Factor PR					
q15	.90				.53
q11	.69				.64
q1	.66				.60
q10	.52				.39
Factor MG					
q12		.86			.83
q2		.83			.76
q7		.83			.75
Factor ET					
q8			.97		.84
q3			.86		.74
q13			.79		.76
Factor CH					
q4				.85	.73
q9				.51	**.55**
q6				.55	**.63**
q5				.42	**.49**
q14				.41	**.60**

Note. N = 1,183. Factors were extracted using a Promax rotation and Principal Axis Factoring. A cutoff of .4 was used to define salient loadings. PR = Nefarious Public Relations, MG = Malevolent Global Conspiracy, ET = Extraterrestrial Cover-up, CH = Covert Harm. Unique variances greater than the associated item's factor loading are bolded.

Figure 3

Laten Factor Structure of EFA of GCBS, Men



Alternative Factor Structure for Women

For women, neither univariate or multivariate normality were met; *HZ*=2.56, p<.05. Of the 105 item correlations, 103 (98.10%) were stronger than .3 and all were significant (Table 9). Bartlett's test of sphericity confirmed that the correlation matrix was not random, $X^2(105)= 9684.98$, p<.001, and a small though nonzero determinant of .0001 suggested that extreme multicollinearity was not a concern. A KMO statistic of .94 indicated sampling adequacy.

A parallel analysis was conducted, again suggesting the extraction of four factors. These factors were allowed to correlate using an Promax rotation. Principal Axis Factoring was chosen as the extraction method. A cutoff of .4 was used to define salient loadings. The resulting solution accounted for 62 percent of variance in item responses among women and demonstrated good absolute fit (RMSEA of .04 and RMSE of .02). All but one item (q4) saliently loaded only one of the four factors. The clean factor pattern and visualization for this group-specific structure can be found in Table 10 and Figure 4, respectively.

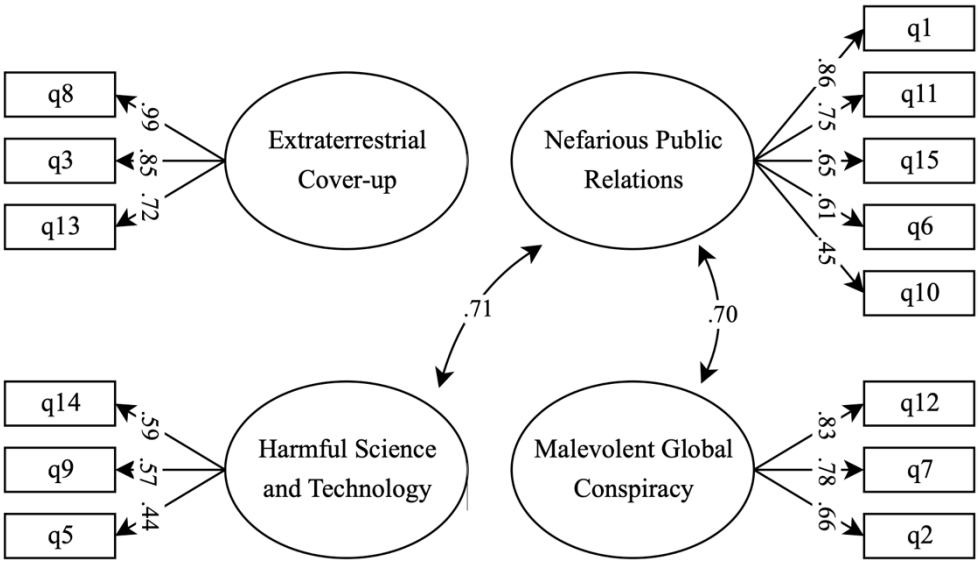
Table 10

Clean Factor Pattern for EFA of GCBS, Women

Item	Factor loading				h^2
	1	2	3	4	
Factor PR					
q1	.86				.66
q11	.75				.65
q15	.65				.44
q6	.61				.59
q10	.45				.33
Factor ET					
q8		.99			.87
q3		.85			.73
q13		.72			.68
Factor MG					
q12			.83		.79
q7			.78		.67
q2			.66		.58
Factor ST					
q14				.59	**.63**
q9				.57	.56
q5				.44	**.52**

Note. N = 1,086. Factors were extracted using a Promax rotation and Principal Axis Factoring. A cutoff of .4 was used to define salient loadings. PR = Nefarious Public Relations, ET = Extraterrestrial Cover-up, MG = Malevolent Global Conspiracy, ST = Harmful Science and Technology. Unique variances greater than the associated item's factor loading are bolded.

Figure 4
Latent Factor Structure of EFA of GCBS, Women



Discussion

This analysis provides a more nuanced approach to describing the latent factors that underly conspiratorial ideation. While Brotherton, French, & Pickering came to a five-factor solution, a four-factor model demonstrated nearly identical fit while consolidating items from three strongly correlated factors with substantial conceptual overlap. Relative to the original model, factors "Extraterrestrial Cover-up" and "Malevolent Global Conspiracy" remained unchanged. However, "Harmful Science and Technology" now describes scientific and technological organizations and tools that can and do cause harm, while the central feature of "Nefarious Public Relations" is deceit. Compared to the original structure, the modified structure draws a distinction between theories which assume premeditation and misdirection and those that do not.

Additionally, significant lack of invariance between genders was revealed, suggesting that presentation of conspiratorial ideation depends on gender. Most notably, the factor "Covert Harm" was only present in the EFA of men and "Harmful Science and Technology" in that of women. "Covert Harm" and "Harmful Science and Technology" describe similar beliefs; however the latter generalizes harm beyond that inflicted by science and technology. This compositional difference was due to variable loading of two items: q6 and q4. For men, q6 loaded with items related to the infliction of harm, while for women, it loaded with items related to deception.

For men, q4 also loaded with items related to the infliction of harm, but for women, this item failed to load saliently on any factor. This resulted in the reduction of "Covert Harm" to a factor describing *only* the harm caused by science and technology.

This pattern suggests that the threat of harm conveyed by these items was more salient to men than women. Item q6 ("The government permits or perpetrates acts of terrorism on its own soil, disguising its involvement") provides a clear demonstration of this effect. The former clause describes a violent threat while the latter describes deceit. Compared to women, men score higher on self-reported and objective neurobiological measures of reactive aggression and demonstrate a stronger limbic response to ambiguous social stimuli (Im et al., 2018; Newhoff et al, 2015). This may explain why item q6, which conveys both threatening ("acts of terrorism") and nonthreatening ("disguising its involvement") information, was perceived by men as primarily harmful and by women as primarily deceitful.

Together, these findings provide an empirical basis for further development of gender-specific structures of conspiratorial ideation. The etiology of conspiratorial ideation and the group-based differences in its structure as discussed in this paper were biological, without consideration of the environmental factors that contribute to the expression of these mechanisms. While an individual's cognition is entirely dependent on their biology, the expression of their biology is largely dependent on their environment. Further research could be done to identify and understand factors that precipitate and amplify conspiratorial ideation, and how these factors may affect some groups more than others. Additionally, confirmatory factor analysis should be used to assess the utility of these gender-specific structures relative to the original five-factor and modified four-factor models.

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Table 1

Means, standard deviations, and correlations with confidence intervals

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14
q1	3.49	1.45														
q2	2.98	1.48	.53**													
q3	2.05	1.39	.36**	.40**												
q4	2.64	1.45	.53**	.55**	.51**											
q5	3.27	1.46	.49**	.47**	.41**	.58**										
q6	3.12	1.50	.63**	.57**	.41**	.61**	.50**									
q7	2.67	1.50	.48**	.69**	.42**	.58**	.46**	.55**								
q8	2.46	1.56	.39**	.38**	.79**	.50**	.42**	.42**	.41**							
q9	2.24	1.42	.42**	.50**	.49**	.57**	.48**	.49**	.53**	.48**						
q10	3.51	1.39	.43**	.38**	.32**	.40**	.44**	.40**	.38**	.36**	.36**					
q11	3.28	1.39	.65**	.53**	.35**	.53**	.51**	.63**	.50**	.37**	.47**	.45**				
q12	2.66	1.50	.53**	.73**	.45**	.61**	.50**	.60**	.77**	.43**	.58**	.40**	.56**			
q13	2.11	1.38	.39**	.41**	.72**	.52**	.44**	.43**	.45**	.78**	.54**	.37**	.41**	.49**		
q14	2.95	1.48	.54**	.52**	.44**	.61**	.55**	.55**	.53**	.46**	.56**	.42**	.57**	.57**	.50**	
q15	4.24	1.09	.51**	.41**	.27**	.39**	.46**	.47**	.39**	.30**	.32**	.45**	.54**	.42**	.30**	.46**

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. * indicates $p < .05$. ** indicates $p < .01$.

Table 6

Means, standard deviations, and correlations with confidence intervals

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14
q1	3.44	1.47														
q2	2.93	1.54	.55**													
q3	1.83	1.29	.36**	.46**												
q4	2.45	1.43	.53**	.59**	.50**											
q5	3.09	1.50	.49**	.51**	.40**	.59**										
q6	3.05	1.53	.63**	.62**	.43**	.65**	.52**									
q7	2.61	1.54	.52**	.75**	.46**	.63**	.49**	.59**								
q8	2.22	1.50	.38**	.44**	.79**	.50**	.41**	.42**	.46**							
q9	2.15	1.40	.44**	.56**	.51**	.61**	.49**	.55**	.57**	.52**						
q10	3.47	1.44	.45**	.42**	.37**	.44**	.46**	.43**	.43**	.40**	.37**					
q11	3.27	1.42	.65**	.58**	.35**	.52**	.51**	.64**	.52**	.38**	.50**	.44**				
q12	2.64	1.54	.56**	.79**	.48**	.67**	.53**	.63**	.79**	.47**	.59**	.43**	.58**			
q13	1.96	1.31	.39**	.48**	.75**	.56**	.45**	.46**	.52**	.79**	.56**	.41**	.41**	.53**		
q14	2.84	1.47	.58**	.58**	.48**	.61**	.55**	.59**	.56**	.48**	.56**	.44**	.59**	.60**	.52**	
q15	4.19	1.16	.51**	.42**	.25**	.37**	.45**	.46**	.39**	.29**	.32**	.46**	.55**	.42**	.28**	.45**

Note. M and *SD* are used to represent mean and standard deviation, respectively * indicates $p < .05$. ** indicates $p < .01$.

Table 8

Means, standard deviations, and correlations with confidence intervals

Variable	*M*	*SD*	1	2	3	4	5	6	7	8	9	10	11	12	13	14
q1	3.52	1.45														
q2	3.06	1.42	.52**													
q3	2.27	1.44	.35**	.34**												
q4	2.81	1.45	.54**	.51**	.49**											
q5	3.43	1.42	.50**	.43**	.39**	.57**										
q6	3.16	1.47	.63**	.51**	.40**	.58**	.47**									
q7	2.73	1.47	.44**	.62**	.40**	.53**	.43**	.52**								
q8	2.68	1.58	.41**	.32**	.78**	.47**	.41**	.41**	.37**							
q9	2.34	1.43	.40**	.45**	.47**	.55**	.47**	.44**	.51**	.44**						
q10	3.51	1.35	.42**	.35**	.27**	.38**	.41**	.38**	.33**	.33**	.37**					
q11	3.29	1.36	.65**	.49**	.35**	.55**	.52**	.61**	.49**	.37**	.46**	.47**				
q12	2.69	1.46	.51**	.67**	.43**	.57**	.48**	.56**	.73**	.39**	.57**	.37**	.54**			
q13	2.24	1.42	.38**	.35**	.69**	.47**	.41**	.41**	.39**	.76**	.51**	.33**	.41**	.46**		
q14	3.06	1.49	.52**	.47**	.39**	.60**	.56**	.52**	.51**	.43**	.56**	.41**	.56**	.55**	.47**	
q15	4.27	1.03	.50**	.39**	.28**	.42**	.48**	.47**	.39**	.31**	.33**	.43**	.53**	.42**	.32**	.48**

Note. *M* and *SD* are used to represent mean and standard deviation, respectively. * indicates $p < .05$. ** indicates $p < .01$.