REVIEW

Effects of Big Five, HEXACO, and Dark Triad on Counterproductive Work Behaviors: A Meta-Analysis

Yating Miao[1,2,*], Jigan Wang[1], Rundian Shen[1] and Dongsheng Wang[3]

[1]School of Business, Hohai University, Nanjing, 210098, China

[2]Human Resource Department, Nanjing Vocational Institute of Transport Technology, Nanjing, 211188, China

[3]Department of Water Resources of Jiangsu Province, Nanjing, 210029, China

*Corresponding Author: Yating Miao. Email: maxine_myt@hhu.edu.cn

ABSTRACT

Purpose: This study investigates the effects of Big Five, HEXACO, and Dark Triad personality traits on counterproductive work behaviors (CWBs), and examines the moderating effects of countries where the studies were carried out, gender rate of samples, and scales used to measure personalities. **Method:** Following the rules of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), we include 74 empirical studies published between 2007 and September 2022 with 83 samples and 394 correlations. Studies are selected from both English databases such as Web of Science and Chinese databases such as CNKI. The meta-analysis and meta-regression analysis were both performed using the Comprehensive Meta-Analysis (CMA) program, version 3.7. **Results:** Although emotionality is irrelevant to CWBs, other Big Five, HEXACO, and Dark Triad personality factors are all significant predictors of CWBs. The effect of Dark Triad ($\rho = 0.412$) is stronger than that of Big Five ($\rho = -0.176$) and HEXACO ($\rho = -0.221$). Gender negatively moderates the positive relationship between Dark Triad traits (total and subdimensions) and CWBs. The moderating effects of countries and scales are only significant for very few personalities. **Conclusion:** Personality traits are important antecedents of CWBs, and gender ratio plays a role as moderator for some personality traits. We propose that organizations should pay more attention to the mental health of employees and future studies could investigate other types of characteristics and moderators.

KEYWORDS

Personality traits; CWBs; Big Five; HEXACO; Dark Triad

1 Introduction

Counterproductive work behaviors (CWBs) has troubled managers for a very long time as a notorious negative behavior that harms organizations, their stakeholders, and employees. Consequently, CWBs has been of much interest to scholars specializing in organizational behavior. CWBs embodies various kinds of specific behaviors that occur in the workplace, for instance absence, abuse, disruptive behavior, stealing, sabotage, and even aggression. These behaviors are also categorized as workplace deviance behaviors, workplace antisocial behaviors, organizational misbehaviors, or non-compliant behaviors [1–4]. Scholars and managers are searching for solutions to avoid CWBs in the organization by identifying

the factors and influence mechanisms that lead to employee CWBs, among which personality traits are important individual factors [5]. Whereas most studies have treated personality traits as moderators of the effect of other antecedents on CWBs [6,7], a number of studies on organizational psychology have evaluated the direct connection between personality traits and CWBs [8–11]. However, personality is the reflection of an individual's real thoughts, regardless of whether they are noticed or not. Furthermore, human actions are almost always the outcome of their brain activity—in other words, their thoughts and considerations. For this reason, it is essential to determine the personality traits that could trigger CWBs, and how they do so.

The most common studied personality model is Big Five, also known as the Five Factor Model (FFM) or OCEAN model, whose factors comprise openness, conscientiousness, extraversion, agreeableness, and neuroticism or its opposite—emotional stability [12]. In 2000, honesty was identified as the sixth factor and subsequently a new personality structure was created called HEXACO, comprising honesty-humility, emotionality, extraversion, agreeableness, conscientiousness, and openness [13,14]. Big Five and HEXACO consist of positive and neutral subdimensions, whereas another often discussed personality model, Dark Triad, (Machiavellianism, narcissism, and psychopathy) represents characteristics that are "bad" [15], but still within the range of normalcy. The Dark Triad is often used to explain the negative reasons for individual behaviors, especially behaviors such as CWBs that is harmful to organizations [16,17].

In recent years, there have also been several meta-analyses summarizing the relationships between these personality factors and CWBs. For instance, it has been pointed out that narcissism is the largest unique predictor of workplace deviance and the correlation is moderated by ingroup collectivist culture, publication status of the study in which results are reported (published *vs*. unpublished), and narcissism's facets [18]. Big Five and HEXACO are also proven to correlate with workplace deviance. Among the factors that comprise these models, honesty-humility shows the strongest relationship with workplace deviance among all facets. Openness and extraversion are not related to CWBs [19–21]. Moreover, compared with Big Five, Dark Triad—consisting of three malevolent personality traits—is a stronger predictor of both interpersonal workplace deviance and organizational workplace deviance [22].

Although researchers have noted the importance of these three personality models for predicting CWBs, some issues remain unresolved. First, it is still not certain whether these personalities and their subdimensions are all significantly related to CWBs and to what extent are they related, because the results of previous studies differ from each other. For example, some empirical and meta studies have found openness to be uncorrelated with CWBs [23–25], whereas others have shown the relationship to be either significantly negative [26,27] or, conversely, significantly positive [28–30]. Second, previous meta-analyses on this topic have failed to simultaneously compare the effects of Big Five, HEXACO, and Dark Triad traits, making it unclear which personality traits most strongly predict CWBs. Additionally, some such studies have focused on other aspects (for instance, comparing the associations of the Big Five and HEXACO personality models with CWBs at the domain or facet levels). Third, previous meta-analyses have not included relevant articles in Chinese, which raises doubts about whether the results are applicable to the Chinese context. Fourth, it is important to examine the effects of a wider range of moderating variables that may affect the relationships between personality traits and CWBs. Hence, the current study extends previous relevant meta-analyses by investigating which personality traits may predict CWBs and which have the strongest effects (and thus should receive more attention from managers). We examined the strength of the correlations and explored additional potential factors that may affect these correlations.

2 Theory and Hypothesis

2.1 Big Five, HEXACO, and CWBs

HEXACO is sometimes considered a superior version of Big Five, due to the addition of the sixth factor and revised explanation of the other five factors [31]. Extraversion, conscientiousness, and openness are the same in both personality structures, and empirical evidence suggests that these traits result in fewer interpersonal and organizational CWBs [32,33]. Extraversion refers to being outgoing, loving, talkative, and sociable [34,35], resulting in extroverted people who tend to take actions to maintain interpersonal relationships or "guanxi" and to be accepted by others as 'playing nice' or helping colleagues. Conscientious employees are diligent, responsible, and disciplined, thus strictly complying with the rules and regulations within and outside the organization [36]. Openness refers to openness to experience, embodying a creative, unconventional, and intellectual personality. People with such a personality would enjoy cooperation, and are thus are less likely to be involved in CWBs [26,29].

Agreeableness and emotionality in the Big Five model have been pointed out as being different from those in the HEXACO model [34,37]. On the one hand, although emotionality is close to neuroticism in being fearful and anxious, given that the opposite of neuroticism (emotional stability as calm, content, and relaxed) differs from the other side of emotionality (e.g., being independent, tough, and brave), we treat emotionality, neuroticism, and emotional stability as three separate independent variables. Highly emotionally stable individuals rarely experience negative emotions, thus lacking motivation to perform CWBs. Likewise, emotionality is also negatively related to workplace deviance because people high in this trait show the same stable and relaxed character [29,38]. Neuroticism, in contrast, is presumed to be a positive predictor of unethical behaviors, antisocial behaviors, poor attendance, bullying, and sabotage in workplace, featuring anxiety, fear, and envy [39,40]. On the other hand, although Big Five agreeableness has some facets that are similar to honesty-humility, it still shares most characteristics with HEXACO agreeableness, such as being patient, gentle, and tolerant [34,35,37]. Considering honesty-humility has already been included as a new personality, the label "agreeableness" represents the similar part of both Big Five agreeableness and HEXACO agreeableness, describing people who are usually mild, gentle, tolerant, and seldom engage in CWBs. The label honesty-humility refers to not only HEXACO honesty-humility, but also the small part of Big Five agreeableness that is similar to honesty-humility, depicting a person who is commonly defined as honest, faithful, and not greedy or deceitful [13], resulting in low level of CWBs, because individuals with these characteristics would be unlikely to harm the people around them or the organization they work in [41–43].

To summarize, we put forward following hypotheses:

H1: Big Five (H1a) and HEXACO (H1b) are significantly negatively related to CWBs.

H2: Extraversion (H2a), agreeableness (H2b), conscientiousness (H2c), openness (H2d), emotional stability (H2e), honesty-humility (H2f), and emotionality (H2g) are significantly negatively related to CWBs, while neuroticism (H2h) is significantly positively related to CWBs.

2.2 Dark Triad and CWBs

Dark Triad traits are certainly removed from normal personality traits, although people with these traits cannot be clinically diagnosed as abnormal [44]. Although Machiavellianism, narcissism, and psychopathy appear to be three separate characteristics, they do have something in common, such as being selfish, cold-hearted, and irresponsible, and are therefore recognized as significant predictors of deviant behaviors [45,46]. People with high levels of Machiavellianism enjoy the feeling of manipulating others, while psychopaths gain satisfaction by hurting others. Therefore, they are more likely to engage in abuse and interpersonal aggression [41,44,47]. Narcissists do not trust their colleagues, and readily become angry and vindictive

once they are not appraised or looked up to by people around them, leading to unethical behaviors and even bullying [48,49]. Accordingly, we hypothesize that:

H3: Dark Triad total is significantly positively related to CWBs.

H4: Machiavellianism (H4a), narcissism (H4b), and psychopathy (H4c) are significantly positively related to CWBs.

2.3 Moderators of the Relationship between Personality Traits and CWBs

2.3.1 Countries

The three personality models are so famous in psychology that they have been translated into various languages and studied worldwide. However, there may be differences when understanding the factors and facets due to the local culture [26,50]. Moreover, the HEXACO model was named based on a conceptual similarity comparison of descriptions and adjectives of the six factors in 12 languages, to minimize differences in the understanding of deviance caused by language and culture [51]. Consequently, studies carried out in different countries with local participants may generate diverse scores even when measuring the same personality, affecting the result of our meta-analysis. Thus, we hypothesize that:

H5: The geographical region in which the empirical study was carried out significantly moderates the relationships between Big Five (total and subdimensions) (H5a), HEXACO (total and subdimensions) (H5b), Dark Triad (total and subdimensions) (H5c), and CWBs.

2.3.2 Gender Ratio

Literature has shown that a gender gap exists in CWBs and personality traits, because males engaging more in aggression and workplace deviance than females do [52–54], and females tend to score higher on agreeableness and lower on emotional stability [55]. As a result, it is reasonable to suppose that the ratio of men to women in each study might have an influence on the final result. Therefore, we hypothesize that:

H6: The gender ratio of participants negatively and significantly moderates the relationships between Big Five (total and subdimensions) (H6a), HEXACO (total and subdimensions) (H6b), Dark Triad (total and subdimensions) (H6c), and CWBs. A higher number of females in the sample will be associated with weaker main effects.

2.3.3 Scales

Abundant scales were developed according to various contexts to measure Big Five, HEXACO, and Dark Triad, together with their 11 subdimensions. Some of the scales are frequently applied to studies, such as the Big Five Inventory (BFI) and the International Personality Item Pool (IPIP) for Big Five model [33,56], the HEXACO Personality Inventory-Revised (HEXACO PI-R) for HEXACO model [43], the Dirty Dozen (DD), and Short Dark Triad (SD3) for the Dark Triad model [41,57]. The reliability and calculations vary between scales, potentially leading to different results. Therefore, we hypothesize that:

H7: Scales used to measure personality traits significantly moderate the relationships between Big Five (total and subdimensions) (H7a), HEXACO (total and subdimensions) (H7b), Dark Triad (total and subdimensions) (H7c), and CWBs. A higher frequency of scale use will be associated with stronger main effects.

3 Method

3.1 Inclusion Criteria

Studies to be included in the final meta-analysis should meet several criteria. First, the study ought to be empirical research exploring the relationship between personality traits and CWBs. Literature reviews, case studies, and theoretical articles are excluded. Second, counterproductive behaviors should occur at the workplace and samples should comprise employees or people with working experience. Studies with

counterproductive behaviors happening outside the workplace or from the perspective of victims are deleted, along with student samples. Third, sample size and correlation coefficients (including other statistics that can be converted into correlation coefficients, such as t statistics, F statistics, etc.) must be reported in the study. Fourth, independent variables do not contain the subdimensions of personality traits (e.g., boldness and meanness as the subdimensions of psychopathy). Fifth, duplicates will be ruled out. For example, multi-stage publications of one study or articles sharing same sample data will be treated as one.

The selection process follows the guidelines of Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) [58].

3.2 Search Strategy

Altogether, six libraries were chosen for literature retrieval, three in Chinese (China National Knowledge Infrastructure, Wanfang, Vip), and three in English (Web of Science, EBSCO, Elsevier Science Direct). Search terms were (personality traits OR personality OR employee characteristics OR Big Five OR openness OR conscientiousness OR extraversion OR agreeableness OR neuroticism OR HEXACO OR honesty-humanity OR emotionality OR Dark Triad OR Machiavellianism OR narcissism OR psychopathy) AND (counterproductive work behavior OR CWBs OR counterproductive OR workplace deviance behavior OR workplace bullying OR workplace antisocial behavior OR workplace aggression). Publication time was from 2007 till September 2022, because the first article in Chinese that could be retrieved discussing counterproductive behavior was published in 2008. We set the start date one year earlier, to 2007, to be more rigorous. Literature type includes, but is not limited to, journal articles, conference proceedings, theses or dissertations, and book chapters.

An initial search resulted in 888 studies, including nine through document delivery. Of these, 814 articles were removed from the list because they did not match the criteria stated above (see Fig. 1), leaving 74 studies with 83 samples of 28377 participants for the final meta-analysis.
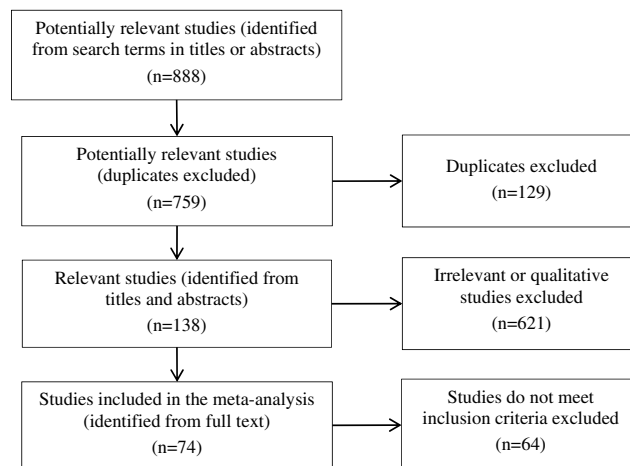
Figure 1: Study selection process

3.3 Data Coding and Reliability Check

Information and data were collected from the studies for the meta-analysis. Important data such as sample size, correlation coefficients, Cronbach's α of scales, and moderators were coded as well, as some basic information of each study such as authors, titles, year, industry, and article type. When the study provided data regarding both subdimensions of CWBs and CWBs total, only CWBs total was coded. However, if the study only reported data for one or several specific forms of CWBs (e.g., cyberloafing or

workplace bullying), all data were coded. When both self-rating CWBs and supervisor-rating CWBs were displayed, self-rating CWBs was coded. We believe that personality may also play a role when participants rate themselves, making self-rating CWBs data more connected with personality traits.

Concerning the moderators, the geographical regions from which samples were taken, were classified based on continent, according to the descriptive analysis provided by each study (e.g., USA and Canada as North America, China and India as Asia). We use female rate as the variable measuring the gender difference in samples. As for the scales adopted to measure personality traits, we identified the frequently used scales by calculating the numbers of studies using each scale. Seven of 32 scales were categorized as frequently used scales, accounting for 71.23% of studies included, and were coded as 1. The other 25 scales were categorized as seldom-used scales, and were coded as 0.

Two PhD students worked separately to ensure the reliability of coding. Studies were divided into two groups for the first round of coding, after which two coders exchange their groups of studies for the second round of coding. The inter-rater agreement percentages of included studies, sample size coding, and correlation coefficients coding are 97.14%, 96.25%, and 97.46%, respectively.

3.4 Data Extraction

Microsoft Excel was used for both coding and data extraction. This study adopted Hedges & Olkin's approach to correct the measurement error [59]. First, the Pearson's r of every empirical study was converted into true correlation ρ, using the Eq. (1) below:

$$\rho_i = \frac{r_i}{\sqrt{\alpha_{xi}\alpha_{yi}}} \tag{1}$$

r_i refers to the original Pearson's r in the i-th study; α_{xi} and α_{yi} refers to the reliability of independent variable x and dependent variable y in the i-th study; ρ_i refers to the correlation in the i-th study after correcting the measurement error.

Then, we used corrected ρ_i to calculate population effect size. If the reliability was not reported in the study, the weighted mean of this variable in all studies was used instead.

3.5 Meta-Analysis Procedure

3.5.1 Publication Bias

Publication bias refers to the situation in which, when collecting literature, researchers can only collect articles that have already been published, omitting unpublished studies. This causes the effect size of the meta-analysis to be higher than the real value. Therefore, to test publication bias, we examine whether studies included by the researchers are comprehensive and representative. Usually, a test of publication bias is needed when the meta-analysis includes more than ten studies [60]. Rosenthal proposed a fail-safe N coefficient for the publication bias test in 1979 [61]. When the meta-analysis shows a significant effect, the least number of unpublished studies needed to turn the significant result into an insignificant one is referred to as the fail-safe N coefficient. Thus, normally only when the effect size is significant should the fail-safe N be reported [62,63]. High fail-safe N means that researchers have to include a great number of unpublished studies with a conclusion of insignificant relationship to reverse the result of the current study, leading to little possibility that the result of meta-analysis could be changed, i.e., the publication bias is not severe. Rosenthal also proposed the "$5k + 10$" criterion of fail-safe N, where k refers to the number the studies included in the meta-analysis [61]. That is to say, a fail-safe N coefficient higher than this criterion suggests a minor publication bias. The "$5k + 10$" criterion is adopted in this study, while the fail-safe N is reported only when the effect size is significant.

3.5.2 Heterogeneity Test and Effect Model

There are two types of effect model that could be used in a meta-analysis—random effect model and fixed effect model. The random effect model is more suitable if a clear heterogeneity between the included studies exists [60]. Considering apparent differences were witnessed when coding the studies, such as sample type (e.g., company employees or civil servants), questionnaire response rate, scales used to measure the variables, methods to analyze data, industry (e.g., manufacturing industry or finance industry) and countries or regions where the study was carried out (e.g., USA, China or Europe), it is appropriate to use the random effect model in this study. To further confirm our choice, a heterogeneity test was conducted to check if the results of every single study could be combined. Q statistics and I-squared statistics (I^2) are often utilized to examine heterogeneity. If Q statistics are significant whilst I^2 is over 50%, heterogeneity among studies included can be demonstrated, indicating that researchers should choose a random effect model in the meta-analysis.

3.5.3 Main Effect

To analyze the main effect, we first need to identify which format of effect size to use in the meta-analysis, based on the type of input data. Because this study aims to unveil the relationship between personality traits and CWBs, Pearson's r is used during the analysis procedure. The correlation guidelines are Cohen's (1992), suggesting r = 0.10 is considered to represent small effects, r = 0.30 moderate effects, and r = 0.50 large effects [64].

Because Big Five and HEXACO personality traits share four same personality traits—namely extraversion, agreeableness, conscientiousness, and openness—the results of these two personality models are displayed together. To calculate the effect sizes of Big Five total and HEXACO total, we distinguished between studies on these two models by carefully reviewing the descriptions of variables. Given that most studies looked into the connection between multiple personality traits and CWBs, making the number of r coefficients much larger than that of studies included (394 *vs*. 74), we report the number of correlation coefficients (k) rather than the number of studies. Besides, we also report the cumulative sample size (N), the sample-weighted mean correlation ($\bar{r}$) and the population effect size (ρ) and its 95% confidence interval, standard deviation of ρ (SD_ρ), and 2-tail test of the population effect size (Z).

3.5.4 Moderating Effect

To investigate our hypotheses, the moderating effects of three variables are examined. The geographical region from which samples are taken is a discrete variable; thus, we use subgroup meta-analysis to uncover the moderating effect of region by observing the heterogeneity between subgroups. We report results in the same way as for the main effect. In contrast, the gender ratio and scales used to measure personality traits are continuous variables. Accordingly, we use meta regression analysis to test the moderating effects. We report regression coefficient (β) and its 95% confidence interval for meta-regression analysis instead of the population effect size (ρ) for meta-analysis.

Comprehensive Meta-analysis (CMA), version 3.7, is used for both meta-analysis and meta-regression analysis.

4 Results

4.1 Publication Bias and Heterogeneity

Table 1 presents the results of heterogeneity test and publication bias. All fail-safe N coefficients outnumber the "$5k + 10$" criterion, suggesting no publication bias in this study. Furthermore, all Q statistics are significant at the level of 0.01 or above, while all I^2 are over 50%. Hence, heterogeneity in this study is confirmed and the random effect model is used for data analysis.

Table 1: Results of heterogeneity test and publication bias

Personality traits	k	N	Q	p	I²	Fail-safe N
Big Five (total)	266	19502	8694.648	0.000	96.952	205018
HEXACO (total)	41	4608	573.801	0.000	93.029	9491
Extraversion	42	12731	726.229	0.000	94.354	1542
Agreeableness	72	20072	1142.205	0.000	93.784	60229
Conscientiousness	72	20560	1140.036	0.000	93.860	55758
Openness	39	12016	671.480	0.000	94.341	662
Neuroticism	40	10821	671.251	0.000	94.190	10527
Emotional stability	25	6226	167.346	0.000	85.658	3622
Honesty-Humility	10	3131	20.965	0.013	57.072	1382
Emotionality	7	2287	102.179	0.000	94.128	—
Dark Triad (total)	87	8431	2207.554	0.000	96.104	87511
Machiavellianism	32	6347	602.812	0.000	94.857	6206
Psychopathy	27	5945	293.635	0.000	91.145	2432
Narcissism	28	6181	937.819	0.000	97.121	3176

4.2 Main Effect

Table 2 shows the meta-analysis results for the main effects. There exists a significant, although small, effect between Big Five total and CWBs at the level of 0.001; the same is observed with HEXACO total and CWBs, proving H1. To be specific, extraversion, agreeableness, conscientiousness, openness, neuroticism, emotional stability, and honesty-humility are significantly related to CWBs at the level of 0.05 or above, confirming H2a to H2f, and H2h. Among these traits, extraversion, agreeableness, conscientiousness, openness, emotional stability, and honesty-humility are negatively related to CWBs, while neuroticism is positively related to CWBs. Nonetheless, the population effect sizes demonstrate small and moderate effects, given that $|\rho|$ is no more than 0.404. Emotionality have no effect on CWBs; thus, H2g is rejected.

For Dark Triad personality traits, in contrast, both total and subdimensions are related to CWBs positively and significantly at the level of 0.001. Although population effect sizes are slightly higher than those of Big Five and HEXACO, this still indicates small and moderate effects. As a result, H3 and H4 are verified.

Table 2: Meta-analysis results of main effect

Personality traits	k	N	$\bar{r}$	ρ	SD_ρ	95% CI		Z	p
						LL	UL		
Big Five (total)	266	19502	−0.143	−0.176	0.278	−0.209	−0.142	−9.937	0.000
HEXACO (total)	41	4608	−0.183	−0.221	0.213	−0.291	−0.149	−5.909	0.000
Extraversion	42	12731	−0.082	−0.105	0.217	−0.173	−0.035	−2.954	0.003
Agreeableness	72	20072	−0.279	−0.336	0.160	−0.371	−0.300	−17.196	0.000
Conscientiousness	72	20560	−0.300	−0.329	0.194	−0.371	−0.286	−14.129	0.000
Openness	39	12016	−0.064	−0.074	0.216	−0.074	−0.145	−2.026	0.043

(Continued)

Table 2 (continued)

Personality traits	k	N	$\bar{r}$	ρ	SD_ρ	95% CI		Z	p
						LL	UL		
Neuroticism	40	10821	0.180	0.267	0.194	0.207	0.325	8.475	0.000
Emotional stability	25	6226	−0.208	−0.256	0.124	−0.307	−0.204	−9.305	0.000
Honesty-Humility	10	3131	−0.330	−0.403	0.067	−0.449	−0.355	−14.979	0.000
Emotionality	7	2287	−0.117	−0.105	0.224	−0.273	0.070	−1.178	0.239
Dark Triad (total)	87	8431	0.328	0.412	0.298	0.355	0.465	12.990	0.000
Machiavellianism	32	6347	0.355	0.463	0.260	0.385	0.534	10.328	0.000
Psychopathy	27	5945	0.365	0.477	0.195	0.414	0.536	12.914	0.000
Narcissism	28	6181	0.153	0.277	0.344	0.146	0.397	4.075	0.000

4.3 Moderating Effect

4.3.1 Countries

Relationships between the majority of personality traits and CWBs are not moderated by the national context in which the study was carried out, except for emotional stability and Machiavellianism, partially supporting H5a and H5c, with H5b being rejected (see Table 3). Given that Machiavellianism positively affects CWBs, the moderating effect indicates the differences in the main effect for different regions.

Table 3: Meta-analysis results of the moderating effect of countries

Variables	k	N	ρ	95% CI		Z	p	$Q_{between}$	p
				LL	UL				
Big Five (total)									
Asia	79	4779	−0.171	−0.231	−0.111	−5.477	0.000	8.937	0.063
Europe	63	4076	−0.125	−0.193	−0.055	−3.509	0.000		
North America	72	4908	−0.194	−0.256	−0.130	−5.882	0.000		
South America	13	908	−0.069	−0.217	0.083	−0.887	0.375		
Not limited	39	4831	−0.267	−0.347	−0.183	−6.041	0.000		
HEXACO (total)									
Australia	6	607	−0.391	−0.514	−0.252	−5.207	0.000	5.433	0.143
Europe	15	2213	−0.208	−0.301	−0.111	−4.141	0.000		
North America	19	1580	−0.225	−0.310	−0.136	−4.899	0.000		
Not limited	1	208	−0.366	−0.653	0.013	−1.896	0.058		
Extraversion									
Asia	10	2593	−0.205	−0.322	−0.082	−3.235	0.001	9.930	0.077
Australia	1	607	−0.385	−0.661	−0.017	−2.046	0.041		
Europe	13	4338	−0.017	−0.127	0.094	−0.302	0.763		
North America	13	2468	−0.067	−0.177	0.046	−1.159	0.247		

(Continued)

Table 3 (continued)

Variables	k	N	ρ	95% CI		Z	p	$Q_{between}$	p
				LL	UL				
South America	1	381	0.085	−0.299	0.445	0.424	0.671		
Not limited	4	2344	−0.218	−0.399	−0.021	−2.166	0.030		
Agreeableness									
Asia	17	3751	−0.356	−0.424	−0.284	−9.114	0.000	2.716	0.744
Australia	1	607	−0.400	−0.634	−0.100	−2.565	0.010		
Europe	16	4901	−0.298	−0.372	−0.219	−7.163	0.000		
North America	23	5227	−0.336	−0.398	−0.271	−9.625	0.000		
South America	5	908	−0.403	−0.517	−0.274	−5.736	0.000		
Not limited	10	4678	−0.318	−0.410	−0.219	−6.055	0.000		
Conscientiousness									
Asia	22	4779	−0.312	−0.383	−0.237	−7.784	0.000	2.696	0.747
Australia	1	607	−0.385	−0.653	−0.031	−2.123	0.034		
Europe	13	4402	−0.304	−0.398	−0.205	−5.764	0.000		
North America	24	5466	−0.320	−0.390	−0.247	−7.036	0.000		
South America	1	381	−0.433	−0.688	−0.084	−8.172	0.000		
Not limited	10	4925	−0.396	−0.489	−0.293	−7.036	0.000		
Openness									
Asia	9	2393	−0.099	−0.223	0.027	−1.546	0.122	8.590	0.127
Australia	1	607	−0.389	−0.653	−0.040	−2.174	0.030		
Europe	12	4166	−0.018	−0.127	0.092	−0.314	0.753		
North America	13	2468	−0.057	−0.164	0.050	−1.046	0.295		
South America	1	381	0.170	−0.201	0.498	0.896	0.370		
Not limited	3	2001	−0.249	−0.444	−0.031	−2.235	0.025		
Neuroticism									
Asia	16	2799	0.274	0.173	0.370	5.159	0.000	0.851	0.909
Europe	8	2854	0.309	0.166	0.439	4.116	0.000		
North America	7	2010	0.209	0.048	0.360	2.534	0.006		
South America	5	908	0.282	0.100	0.446	2.998	0.003		
Not limited	4	2250	0.235	0.024	0.425	2.181	0.062		
Emotional stability									
Asia	5	1703	−0.300	−0.394	−0.198	−5.610	0.000	14.374	0.002
Europe	4	847	−0.314	−0.425	−0.195	−4.976	0.000		
North America	12	2846	−0.163	−0.234	−0.090	−4.338	0.000		
Not limited	4	830	−0.406	−0.512	−0.289	−6.297	0.000		
Honesty-Humility									

(Continued)

Table 3 (continued)

Variables	k	N	ρ	95% CI		Z	p	$Q_{between}$	p
				LL	UL				
Australia	1	607	−0.392	−0.541	−0.219	−4.235	0.000	1.387	0.709
Europe	4	1294	−0.373	−0.460	−0.279	−7.289	0.000		
North America	4	1022	−0.444	−0.527	−0.352	−8.570	0.000		
Not limited	1	208	−0.366	−0.541	−0.161	−3.394	0.000		
Emotionality									
Australia	1	607	−0.391	−0.656	−0.040	−2.173	0.030	4.181	0.124
Europe	3	1122	0.031	−0.186	0.245	0.276	0.783		
North America	3	558	−0.137	−0.349	0.088	−1.196	0.232		
Dark Triad (total)									
Asia	33	3582	0.494	0.409	0.569	10.014	0.000	6.770	0.080
Europe	11	1419	0.386	0.219	0.530	4.334	0.000		
North America	14	1245	0.401	0.255	0.528	5.092	0.000		
Not limited	29	2185	0.326	0.222	0.423	5.890	0.000		
Machiavellianism									
Asia	15	2952	0.567	0.479	0.643	10.415	0.000	14.966	0.002
Europe	3	898	0.317	0.056	0.538	2.360	0.018		
North America	4	537	0.546	0.358	0.691	5.052	0.000		
Not limited	10	1960	0.289	0.148	0.418	3.939	0.000		
Psychopathy									
Asia	8	2010	0.569	0.465	0.658	8.845	0.000	5.465	0.141
Europe	5	1419	0.416	0.254	0.555	4.742	0.000		
North America	5	730	0.375	0.207	0.522	4.187	0.000		
Not limited	9	1786	0.473	0.363	0.571	7.485	0.000		
Narcissism									
Asia	10	2295	0.228	0.002	0.431	1.979	0.048	3.563	0.313
Europe	3	898	−0.040	−0.430	0.363	−0.186	0.852		
North America	5	1052	0.375	0.070	0.616	2.381	0.017		
Not limited	10	1786	0.361	0.147	0.542	3.221	0.001		

Meanwhile, it is interesting to notice that even though this moderating effect is not obvious under most circumstances, the correlations between personality traits and CWBs still vary between regions. Particularly, with most independent variables, the subgroups also show significant connection if the main effect is significant. However, the situation is different for the Big Five traits collectively, HEXACO collectively, extraversion, and narcissism. Possible reasons will be discussed later.

4.3.2 Gender Ratio

Gender ratio fails to moderate the connection between Big Five (total and subdimensions), HEXACO (total and subdimensions), and CWBs completely, as can be seen from Table 4. As for Dark Triad, we found strong evidence of the negative moderating effects of gender rate, demonstrating that the higher the number of females in the sample is, the weaker the main effect will be. Therefore, H6a and H6b are rejected, and H6c is fully confirmed.

Table 4: Meta-regression analysis results of the moderating effects of gender rate and scales

Variables	k	N	β	95% CI		Z	p
				LL	UL		
Big Five (total)							
Gender ratio	246	17728	−0.025	−0.204	0.155	−0.270	0.787
Frequent *vs.* seldom used scales			0.058	−0.016	0.132	1.530	0.126
HEXACO (total)							
Gender ratio	41	4608	0.216	−0.229	0.660	0.950	0.341
Frequent *vs.* seldom used scales			−0.192	−0.493	0.108	−1.250	0.210
Extraversion							
Gender ratio	42	12731	0.037	−0.304	0.378	0.210	0.830
Frequent *vs.* seldom used scales			−0.029	−0.181	0.124	−0.370	0.715
Agreeableness							
Gender ratio	72	20072	−0.130	−0.342	0.083	−1.200	0.232
Frequent *vs.* seldom used scales			−0.029	−0.118	0.059	−0.650	0.516
Conscientiousness							
Gender ratio	72	20560	−0.227	−0.479	0.025	−1.770	0.077
Frequent *vs.* seldom used scales			−0.026	−0.126	0.075	−0.050	0.617
Openness							
Gender ratio	39	12016	0.257	−0.094	0.608	1.430	0.152
Frequent *vs.* seldom used scales			0.089	−0.066	0.243	1.120	0.262
Neuroticism							
Gender ratio	40	10821	0.253	−0.076	0.581	1.510	0.132
Frequent *vs.* seldom used scales			0.100	−0.084	0.285	1.070	0.286
Emotional stability							
Gender ratio	25	6226	−0.105	−0.431	0.220	−0.630	0.526
Frequent *vs.* seldom used scales			−0.082	−0.181	0.018	−1.600	0.109
Honesty-Humility							
Gender ratio	10	3131	−0.282	−0.707	0.143	−1.300	0.193
Frequent *vs.* seldom used scales			−0.190	−0.366	−0.015	−2.120	0.034
Emotionality							
Gender ratio	7	2287	−0.778	−1.925	0.368	−1.330	0.183
Frequent *vs.* seldom used scales			0.253	−0.751	0.245	−1.000	0.319

(Continued)

Table 4 (continued)

Variables	k	N	β	95% CI		Z	p
				LL	UL		
Dark Triad (total)							
Gender ratio	87	8431	−0.984	−1.511	−0.456	−3.660	0.000
Frequent *vs.* seldom used scales			0.087	−0.046	0.220	1.280	0.201
Machiavellianism							
Gender ratio	32	6347	−0.836	−1.654	−0.018	−2.000	0.045
Frequent *vs.* seldom used scales			0.163	−0.023	0.348	1.720	0.086
Psychopathy							
Gender ratio	27	5945	−0.815	−1.523	−0.106	−2.250	0.024
Frequent *vs.* seldom used scales			0.240	0.100	0.380	3.36	0.000
Narcissism							
Gender ratio	28	6181	−1.071	−2.065	−0.077	−2.110	0.035
Frequent *vs.* seldom used scales			0.292	0.026	0.558	2.150	0.032

4.3.3 Scales

The meta-regression analysis results reveal that the moderating effects of scales applied to measure personality traits are even smaller than those of gender ratio and partially support H7c, with H7a and H7b being completely rejected. For Big Five and HEXACO, scales only significantly and negatively moderate the relationship between honesty-humility and CWBs, at the level of 0.05. Because CWBs is negatively affected by honesty-humility, the moderating effect means that the more common the scale is, the weaker the relationship between honesty-humility and CWBs will be. This pattern is opposite to that predicted by hypothesis H7b.

In regard to Dark Triad traits, scales positively moderate the correlations between psychopathy and narcissism, and CWBs. Because the overall Dark Triad personality traits positively affect CWBs, the more common the scale is, the stronger the effect will be.

5 Discussion

The current meta-analysis provides several updated findings, as follows:

1. The effect of Dark Triad traits on CWBs ($\rho = 0.412$) is larger than that of Big Five traits ($\rho = −0.176$) and HEXACO traits ($\rho = −0.221$). The three strongest predictors of CWBs are psychopathy ($\rho = 0.477$), Machiavellianism ($\rho = 0.463$), and honesty-humility ($\rho = −0.403$), the former two being positive and the last one being negative.
2. Emotionality has no effect on CWBs, while both extraversion ($\rho = −0.105$) and openness ($\rho = −0.074$) are significantly negatively correlated to CWBs, although the effects are very small.
3. Gender ratio of samples negatively moderates the relationship between Dark Triad and CWBs, meaning that the larger the number of women participating in the research, the weaker the negative effect of Dark Triad on CWBs will be.

Dark Triad personality traits appear to more strongly predict CWBs than do Big Five and HEXACO traits. The effect sizes for Dark Triad (total) ($\rho = 0.412$), Machiavellianism ($\rho = 0.463$), and psychopathy

(ρ = 0.477) were large, and the effect size for Narcissism was moderate. However, the effect sizes for Big Five and HEXACO totals and their subdimensions were generally small or moderate, and one was very small (openness, ρ = −0.074). In addition, Dark Triad traits were all positively related to CWBs, indicating that people who score highly on these personality traits engage more in CWBs. Conversely, except for neuroticism, the Big Five and HEXACO traits were negatively correlated with CWBs. This shows that employees who score highly on extraversion, agreeableness, conscientiousness, openness, emotional stability, and honesty-humility, and score low on neuroticism, tend to engage less in CWBs.

The insignificance of emotionality as well as the proven relation between extraversion, openness, and CWBs is novel, given that some earlier meta-studies have demonstrated the opposite effects [20,21]. This may result from the number and sample size of included studies. To be more specific, only seven studies report the r coefficients concerning emotionality and CWBs with a total sample size of only 2287. Despite the fail-safe N for emotionality being 52 (not reported due to the non-significant correlation), exceeding the "$5k + 10$" criterion, the result might be different if more statistical data could be obtained. However, based on our inclusion criteria, it is impossible for the current study to include more articles. A possible reason for the small but non-negligible effect of extraversion and openness could be the diversity of "nationalities" of studies included. As can be seen from the national differences within the extraversion group and openness group in Table 3, studies from Asia and Australia contribute extensively to the significant main effect.

Although national context only works as a moderator of the effect of emotional stability and Machiavellianism, the main effect varies distinctly across countries. For example, although narcissism is a positive antecedent of CWBs, studies from Europe do not agree with this conclusion. Scholars could pay more attention to this issue to identify the reason for this finding. The moderating effect of gender ratio on Dark Triad traits may be because Machiavellianism, psychopathy, and narcissism are relatively rare among women, who tend to engage less in CWBs [54,65]. Therefore, a greater number of female participants in the sample will lead to a smaller positive effect of Dark Triad traits on CWBs. Additionally, some researchers have pointed out that gender may affect people's judgement of improprieties and unethical workplace behaviors, because women tend to be judged more severely than men [66,67]. This factor may affect the identification of moderating effects, as some of the included studies used supervisor or colleague ratings rather than self-ratings of CWBs. Continental differences can only be witnessed in the case of emotional stability and Machiavellianism, while scales only affect honesty-humility, psychopathy, and narcissism. This demonstrates that people with the same personality traits appear to behave similarly, no matter where they are from. Furthermore, most scales used in the included studies were reliable and valid personality measures, and support the conclusions in each study respectively, regardless of whether they were frequently used scales.

Based on the findings of the current study, we recommend that human resource departments include a personality test during recruitment, or observe applicants carefully, especially their emotions, during interview to avoid hiring people with dark characteristics. It is also important for personnel to balance the gender ratio of employees. This may help in reducing deviant behaviors to some extent. Second, organizations should endeavor to provide a fair, relaxed, and harmonious environment for employees to raise their level of work satisfaction and organization commitment, for example by ensuring fair and encouraging payment, or strict punishment to people who violate the rules and regulations, or by holding team-building activities regularly. Third, the mental health of employees needs to be paid close attention to. Once deviant behaviors emerge, the underlying reason must be identified without delay. It is important for managers, colleagues, and even healthcare professionals to offer help either by counseling, temporary position changes, or clinical treatment.

6 Conclusion

In summary, except for emotionality, Big Five, HEXACO, and Dark Triad are all important personality traits when predicting CWBs. In particular, people with high levels of Dark Triad traits are more likely to engage in CWBs, and gender moderates this positive relationship. Management implications are offered based on the findings.

The current meta-analysis contributes to existing theories in the following ways:

1. We extend the range for meta-analysis by including articles in Chinese and updating the literature to date, and arrive at different findings compared with previous work.
2. We set no limits to the forms of CWBs, such as workplace deviance, bullying, abuse, aggression, theft, fraud, cyberloafing, and knowledge hiding, making the results much more comprehensive.
3. We propose new moderators and test their effect, and include both neuroticism and emotional stability to reconfirm the effect of Big Five traits.

Future meta-analytic research could include more studies, especially on emotionality, to check whether the results remain the same. The moderating effect on Big Five and HEXACO proposed in this study could be reexamined by separating the Big Five subdimensions from HEXACO subdimensions (e.g., Big Five agreeableness and HEXACO agreeableness). Moreover, with the increasing attention toward more personality traits other than the mainstream ones, it would be interesting and meaningful to explore the relationships between employee behaviors and these characteristics such as trait anger, perfectionism, and type T personality.

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