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The Journal of Positive Psychology

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ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rpos20

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To cite this article: Scott I. Donaldson & Stewart I. Donaldson (2021): Examining PERMA+4 and work role performance beyond self-report bias: insights from multitrait-multimethod analyses, The Journal of Positive Psychology, DOI: 10.1080/17439760.2021.1975160

To link to this article: https://doi.org/10.1080/17439760.2021.1975160

THE JOURNAL OF POSITIVE PSYCHOLOGY
https://doi.org/10.1080/17439760.2021.1975160

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Examining PERMA+4 and work role performance beyond self-report bias: insights from multitrait-multimethod analyses

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ABSTRACT

Self-report and monomethod bias threaten the validity of positive work and organizations research. The current study used multitrait-multimethod analyses to examine the relationship between PERMA+4 and work role performance (adaptivity, proactivity, and proficiency) beyond self-report and monomethod bias. Findings from 221 coworker pairs demonstrated convergence between self-reported and collateral-reported PERMA+4 ($r > .85$) and work role performance ($r > .85$). A multitrait-multimethod matrix showed that monomethod trait interrelationships were systematically higher than heteromethod trait interrelationships with inflated correlations ranging from .07 to .20. Monomethod parameter estimates and coefficients of determination were generally higher than in bias corrected self-reports, knowledgeable collateral-reports, and heteromethod parameter estimates. The results provide support for the validity of the relationship between PERMA+4 and work role performance, but also suggest the importance of including procedural design and statistical control methods in positive work and organizations surveys to correct for self-report and monomethod bias.

ARTICLE HISTORY
Received 1 March 2021
Accepted 18 July 2021

KEYWORDS
Self-report bias; monomethod bias; common method variance; positive organizational behavior; MTMM

Introduction

Scientific advances in positive work and organizations research are contingent on valid measurement of employee psychological processes, behaviors, performance and organizational effectiveness. Evidence-based conceptual frameworks describing patterns of organizational behavior tend to inform and guide future research and practice, whereas frameworks with null, controversial, or mixed empirical results tend to wane over time (Donaldson & Grant-Vallone, 2002). Unfortunately, many workplace studies rely primarily on cross-sectional self-report surveys (Pedersen et al., 2016; Wick et al., 2016), making it challenging to disentangle the relationship between constructs from mono-method bias and self-report bias. This problem is especially challenging for researchers asking employees about positive work and organizations constructs such as well-being, strengths, positive functioning, and work role performance (cf. Ackerman et al., 2018). The current study extended the multitrait-multimethod research design (MTMM) used by Donaldson et al. (2020) to examine PERMA+4 and well-being, to focus on whether PERMA+4 is also a predictor of work role performance (; Griffin et al., 2007) beyond self-report bias.

Seligman (2018) clarified that he proposed the original PERMA model as an approach to identifying building blocks that could be developed to improve well-being. The original five building blocks he proposed were: positive emotions, engagement, relationship, meaning, and accomplishment. While there is some empirical support based on self-reports that these five building blocks are predictive of well-being and positive functioning (Kern et al., 2014, 2015), he suggested future researchers explore additional building blocks that may add to the development of well-being and positive functioning. Donaldson and Donaldson (2021) validated four additional building blocks in a workplace sample that were found to be predictive of self-reported work outcomes. The four building blocks included: physical health (biological and psychological health assets), mindset (growth-orientation), environment (physiological safety), and economic security (financial security; cf. Donaldson & Donaldson, 2021 for definitions). The

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Positive Functioning at Work Scale was found to be a reliable and valid measure of PERMA+4, and predictive of important self-reported work outcomes, such as turnover intentions, and work role performance (Donaldson & Donaldson, 2021).

Work role performance in this study is defined by three positive workplace behaviors: organizational adaptivity, organizational proactivity, and organizational proficiency, which often serve as a unifying framework of job performance for uncertain and interdependent organizational contexts (Donaldson et al., 2020; Griffin et al., 2007; Villalobos et al., 2020). The Positive Functioning at Work (PF-W) scale (Donaldson, 2019; Donaldson & Donaldson, 2021) and the Work Role Performance Scale (Griffin et al., 2007) were used in this study to measure the keys constructs, and are both scales with sound psychometric properties for psychological research in workplace settings. The current study design sought to provide data that would help understand and correct for self-report and mono-method bias while examining the relationships between these constructs measured by these validated scales. This was accomplished by gathering knowledgeable coworker reports of PERMA+4 and work role performance, in addition to self-reports which are more commonly use in contemporary workplace research.

Common method variance and self-report bias

The issue of common method variance dates back more than 60 years to D. T. Campbell and Fiske (1959) seminal paper on convergent and discriminant validation by the multitrait-multimethod matrix. The shortcomings of cross-sectional self-report measures have been contentiously debated thereafter, including journal editors stating that the sole use of self-report measures in organizational behavior research is unacceptable (Campbell, 1982; Pedersen et al., 2016; Meade et al., 2007; Schmitt, 1994; Spector, 1994; Wick et al., 2016). Regardless, most workplace researchers agree that monomethod bias inflates parameter estimates between observed measures, and unfortunately often leads researchers and organizational leaders to make erroneous empirical and thus theoretical conclusions about organizational behavior (Podsakoff et al., 2003). For example, Cote and Buckley (1987) showed that more than 26% of variance in a typical research measure is likely due to a common method, which was even as high as 41% in attitudinal measures administered in the business, psychology, and marketing literatures. Moreover, Sackett and Larson (1990) found that 83% of organizational studies used a cross-sectional design and 52% relied exclusively on self-report measures. The well-being and positive work and organizations literature shows a similar trend. Ackerman et al. (2018) reviewed 972 empirical articles linked to positive psychology, and found that nearly 70% of articles used self-report measures and 89% of all scales were cited only once or twice with few validation studies.

In organizational studies, online self-report surveys are the preferred method to save valuable time, resources, and the effort necessary to employ multiple research methods (Miner & Hulin, 2006). Podsakoff et al. (2003) provided a summary of potential sources of common method bias in organizational studies, such as characteristics of items on a survey instrument and the tendency for individuals to respond in socially desirable ways, particularly in the work setting where employees may fear that their responses will get back to their supervisors (Zerbe & Paulhus, 1987). In a meta-analysis, Moorman and Podsakoff (1992) showed a relationship between social desirability bias and organizational behavior constructs, such as job satisfaction and organizational commitment. Thus, the issue of common method variance is cojoined with potential sources of motivational self-report bias, highlighting the need for procedural and statistical methods of bias control in workplace research (Meade et al., 2007; Podsakoff et al., 2003).

Schmitt (1994) proposed a taxonomy of method bias in organizational research defined by the type of measures (e.g., job attitude, performance rating, personality) and potential sources of motivational bias (e.g., acquiescence, social desirability, carelessness, etc.). Donaldson and Grant-Vallone (2002) expanded Schmitt's work by developing a conceptual framework of four factors that motivate self-report bias in organizational research (see Figure 1). For example, an employee who is seeking to leave his or her job (true state of affairs), reporting on turnover intentions (sensitive construct), who is likely to respond in a socially desirable way (dispositional characteristic), and who fears that his or her response may cause him or her to get punished (situational characteristics) is likely to bias his or her response on a self-report instrument.

Current study

While recent research has shown that PERMA+4 is related to well-being and performance at work (Donaldson et al., 2020, 2019ab; S.I. Donaldson et al., 2021), this empirical study examines if the relationships with work role performance hold under MTMM analyses. That is, we examine these relationships using both self-

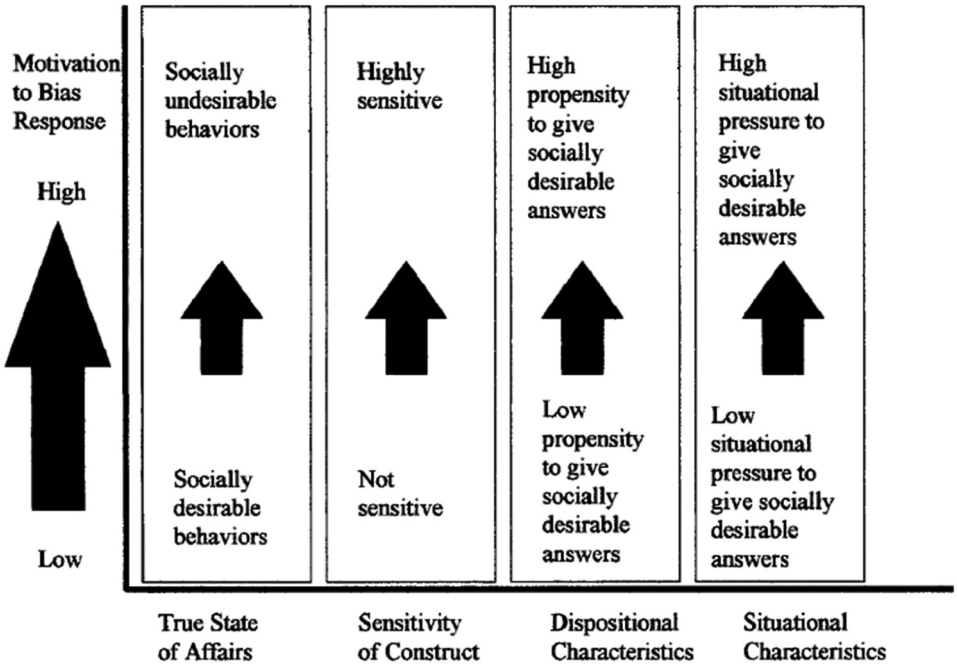

Figure 1. Four factors that influence self-report bias (Donaldson & Grant-Vallone, 2002).

reports and collateral-reports, and attempt to correct for self-report and monomethod bias (Reio, 2010). The data we use in this study are part of a larger study that previously examined subjective-well-being using MTMM analyses (Donaldson et al., 2020). This is one of the first studies we know of to use MTMM analyses to examine the relationship between PERMA+4 and work role performance. The following hypotheses were tested:

(1) A multitrait-multimethod matrix of the Positive Functioning at Work Scale (PERMA+4) and Work Role Performance Scale will demonstrate the desideratum criteria of convergent and discriminant validity proposed by D. T. Campbell and Fiske (1959). That is:
   a. Convergence correlations between self-reported and collateral-reported PERMA+4 and work role performance should be statistically significant.
   b. Values in the validity diagonals should be higher than the values in the heterotrait-heteromethod blocks.
   c. Values in the validity diagonals should be higher than the values in the heterotrait-monomethod blocks.
   d. The relationship between PERMA+4 and work role performance should show the same pattern across all of the heterotrait and monomethod triangles.

(2) Self-reported PERMA+4 will significantly predict self-reported and collateral-reported work role performance.

(3) Collateral-reported PERMA+4 will significantly predict collateral-reported and self-reported work role performance.

Method

Participants

Data collected in this study were part of a larger study on MTMM analyses in the workplace (cf. Donaldson et al., 2020), representing a total sample of 221 co-worker pairs. The average age of participants was 40.33 years old (*SD* = 12.46) with 56.26% female (*n* = 247) and 43.51% male (*n* = 191), and 'other' (.23%). Most participants identified as White (63.64%, *n* = 280), Multiple Races (10.90%, *n* = 48), Black (10.40%, *n* = 46), and Asian (10.40%, *n* = 46). Participant educational attainment included a Bachelor's degree (38.57%, *n* = 167), followed by

Table 1. Demographic characteristics.

Demographic variable	*n*	Mean (SD) or %
Age	435	40.33 (12.46)
Gender		
Female	247	56.26
Male	191	43.51
Other	1	0.23
Race/Ethnicity		
NH-White	280	63.34%
NH-NHOPI	2	0.45%
NH-Multiple race	48	10.90%
NH-Black	46	10.40%
NH-Asian	46	10.40%
NH-AI/AN	4	0.90%
Hispanic	16	3.61%
Degree		
Associate	86	19.86
Bachelors	167	38.57
Masters	114	26.33
Doctorate	32	7.39
Other	34	7.85
Income		
Less than 25k	28	6.36
25–49k	106	24.09
50–74k	104	23.63
75–99k	96	21.81
100–150k	86	19.54
150k+	20	4.54
Industry		
Banking & Financial Services	59	13.56
Education	13	2.98
Food & Beverage	84	19.31
Government	54	12.41
Healthcare	20	4.59
Manufacturing	43	9.88
Media & Entertainment	59	13.56
Retail, Wholesale, & Distribution	40	9.19
Software & IT Services	7	1.60
Non-Profit	27	6.20
Other	29	6.66

Other = I identify my gender in another way or I prefer not to answer; NH = Non-Hispanic, AI/AN = American Indian or Alaska Native, NHOPI = Native Hawaiian and Other Pacific Islander.

a Master's degree (26.33%, *n* = 114), an Associate degree (19.86%, *n* = 86), Other (7.85%, *n* = 34), and a Doctorate degree (7.39%, *n* = 32). Five participants did not report their educational attainment. The majority of participants earned between 25–49k (24.09%, *n* = 106), 50–74k (23.63%, *n* = 104), or 75-99k (21.81%, *n* = 96) US dollars per year. Participants sociodemographic characteristics can be found in Table 1.

Procedure

Qualtrics Panels recruited a representative sample of employee coworker pairs in the US, encouraging survey participation through gift cards, airline miles, and cash incentives. The survey procedure in the current study was analogous to the procedure reported in Donaldson et al. (2020). The survey consisted of two sections: a) the 29-item PF-W Scale (Donaldson & Donaldson, 2021); and b) the Work Role Performance Scale (Griffin et al., 2007). The incumbent employee was asked to respond to the questionnaire and then locate their closest coworker. On the same computer, the close coworkers instructions read, 'For the next stage of the survey, we ask that you please answer the questions about your closest coworker. Thank you for your participation.' The coworker then completed the same items about the incumbent. The final items measured demographic characteristics, such as gender, ethnicity, education, and income, as well as items about self-reported and collateral-reported bias. The research protocol was approved by the Institutional Review Board.

Measures

Positive Functioning at Work Scale (PF-W)

The 29-item PF-W scale was developed and validated by Donaldson (2019) and Donaldson and Donaldson (2021). This measure includes the five PERMA building blocks of well-being plus four new building blocks–physical health, mindset, environment, and economic security. Confirmatory factor analytic fit indices supported a general factor structure of PF-W with nine lower order dimensions, and exhibited validity with other well-being and performance measures (see Donaldson, 2019; Donaldson & Donaldson, 2021). Respondents reported their level of PF-W using a 7-point Likert-type scale ranging from 1 (*strongly disagree*) to 7 (*strongly agree*).

Work role performance

Work Role Performance was measured using a model of positive behavior developed by Griffin et al. (2007). Comparison of alternative factor structures in three employee samples demonstrated nine subdimensions – adaptivity, proactivity, and proficiency at the individual, team, an organizational level. In the current study, the organizational subscale was selected and demonstrated internal consistencies ranging from .85-.90. Respondents reported their level of adaptivity, proactivity, and proficiency in the workplace on a 7-point Likert-type scale from 1 (*strongly disagree*) to 7 (*strongly agree*).

Self-report bias

Donaldson and Grant-Vallone (2002) created a framework that examined an employee's propensity to give biased responses. Some of these factors include sensitivity of a construct, fear of reprisal, and knowledge about a coworker's thoughts, feelings, and behaviors. Two knowledge questions and one question about confidentiality on a 7-point Likert type agreement scale (1 = *strongly disagree*; 7 = *strongly agree*) were included. For example, questions stated 'I am knowledgeable about my coworkers work

environment' and 'I am knowledgeable about my coworkers' thoughts, feelings, and behaviors.' In terms of self-report bias, items on self-admission of error and fear of reprisal were included. For example, one item stated "I have some concern that my answers could get back to my supervisor or coworkers. In total, we asked three questions about biased coworker-reports and two questions about biased self-reports. Controlling for reverse-coded items, employees that reported 5 = *somewhat agree*, 6 = *agree*, or 7 = *strongly agree* were categorized as participants most likely to be accurate.

Analytic strategy

Analyses were performed in R (version 3.6.1, R: A language and environment for statistical computing, 2019) using the psych (Revelle, 2019), Hmisc (Harrell, 2019) and QuantPsyc (Fletcher, 2010) packages. Pearson's linear correlations coefficients were computed between PERMA+4 and Work Role Performance. General linear regression models were fit from self-reported and collateral-reported PERMA+4 to predict self-reported and collateral-reported work role performance. Summaries and confidence intervals showed the results of various model fitting functions.

Results

Outlier analysis

Qualtrics panels initially recorded 212 coworker pairs for the present study. However, 13 pairs had incomplete surveys (e.g., PF-W Scale was not 100% complete) or survey response times less than a few minutes. Huang et al. (2012) suggest it is unlikely to answer survey items faster than the rate of 2 s per item. Thus, Qualtrics sent an additional 22 pairs that satisfied the data screening methods. An outlier analysis was conducted on the final sample using Mahalonobis distance and longstring invariant responding. DeSimone et al. (2015) recommend screening respondents with up to 14 invariant responses, especially for multidimensional surveys with a mixture of positively and negatively worded items. Since the items in the present study were positively worded, invariant responses above 20 were flagged for further review. There were four possible survey points that could result in invariant data – employee 1 self-report, employee 1 collateral-report, employee 2 self-report, and employee 2 collateral-report. In total, there were 82 coworker pairs with invariant responses. In order to assess the impact of outliers on self-reported and collateral-reported PERMA +4 and work role performance, we examined the convergence between the original dataset with 221 pairs and the dataset with outliers removed (i.e., 140 pairs). The difference in the correlations ranged from .00 to .07, which we considered negligible. Thus, the 82 invariant responders were not excluded from the final analyses to retain statistical power.

An exploratory data analysis showed that PERMA+4 and organizational adaptivity, proactivity, and proficiency were normally distributed with no significant skewness or kurtosis statistics. Convergence tests between self-reported and collateral-reported PERMA +4 and work role performance were significant and strong, ranging from r = .61 to .85. Table 2 presents descriptive statistics and convergence (r) between self-reported and collateral-reported PERMA+4 and work role performance.

Evaluating the multitrait-multimethod matrix

The four desideratum validation criteria outlined by D. T. Campbell and Fiske (1959) were tested in *Hypothesis 1*. *Hypothesis 1a* stated that convergence correlations should be statistically significant and warrant future attention. Table 3 shows strong positive correlations (all correlations > .71) for PERMA+4 and work role performance. Thus, the validity diagonals provide support for *Hypothesis 1a*. *Hypothesis 1b* suggested the values in the validity diagonals should be higher than values in its column and row in the heterotrait-heteromethod triangles. This evaluation criterion was supported for PERMA+4 since the convergence correlation was .85 and the values in the row and column heterotrait-heteromethod triangle were below .78.

Table 2. Means, SDs, and zero-order correlations between self-reported and collateral-reported PERMA+4 and work role performance.

	Self-reported		Collateral-reported			
	M	SD	M	SD	Convergence (r)	n
PERMA+4	5.17	1.08	5.06	1.12	.85*	434
Positive emotions	5.16	1.31	5.08	1.28	.71*	434
Engagement	5.21	1.23	5.09	1.22	.70*	434
Relationships	5.18	1.23	5.14	1.23	.74*	442
Meaning	5.30	1.32	5.10	1.25	.73*	435
Accomplishment	5.33	1.20	5.13	1.24	.72*	435
Physical health	5.25	1.18	5.07	1.17	.71*	435
Mindset	5.24	1.23	5.10	1.22	.72*	435
Environment	4.95	1.29	4.95	1.27	.73*	435
Economic security	4.90	1.44	4.86	1.28	.61*	435
Work Role Performance						
Organizational adaptivity	5.24	1.22	5.07	1.22	.71*	426
Organizational proactivity	5.17	1.22	5.04	1.25	.68*	424
Organizational proficiency	5.17	1.25	5.06	1.23	.73*	428

Convergence indicates Pearson correlation coefficients between self-reported and collateral-reported study variables;* = $p < .01$.

Table 3. A multitrait-multimethod matrix of PERMA+4 and work role performance (N = 434).

		Self-Reported				Collateral-Reported			
	Traits	PERMA+4	OADAPT	OPRO	OPROF	PERMA+4	OADAPT	OPRO	OPROF
Self-Reported	PERMA+4	(.97)							
	OADAPT	.86	(.93)						
	OPRO	.83	.82	(.92)					
	OPROF	.85	0.86	0.81	(.92)				
	PERMA+4	**.85**	.76	.75	.78	(.98)			
Collateral-Reported	OADAPT	.76	**.71**	.69	.72	.88	(.93)		
	OPRO	.75	.69	**.68**	.70	.88	.89	(.93)	
	OPROF	.78	.69	0.66	**.73**	.89	.87	.90	(.93)

Reliability diagonals = monotrait-monomethod Cronbach's alpha values in red; Monomethod block = orange heterotrait-monomethod triangles; Heteromethod block = purple heterotrait-heteromethod purple; Validity diagonals = monotrait-heteromethod values in bold; OADAPT = organizational adaptivitiy; OPRO = organizational proactivity; OPROF = organizational proficiency; All correlation coefficients were significant at p < .01.

However, *Hypothesis 1b* was only partially supported in work role performance. Values in the heterotrait-heteromethod triangle for PERMA+4 and work role performance measures were higher than convergence correlations for organizational adaptivity, organizational proactivity, and organizational proficiency. Heterotrait-heteromethod values within work role performance measures provided support for *Hypothesis 1b* with the exception of the convergence correlation between organizational proficiency and organizational adaptivity compared to the convergence correlation for organizational proactivity.

Hypothesis 1 c stated that values in the validity diagonals should be higher than the values in the heterotrait-monomethod blocks. As shown in Table 3, *Hypothesis 1 c* was not supported in the multitrait-multimethod matrix. Finally, *Hypothesis 1d* tested the pattern of trait interrelationships shown in both the monomethod and heteromethod blocks. The interrelationships in the monomethod blocks compared to the heteroblocks were mixed. Thus, these findings provide partial support for *Hypothesis 1d*.

Predictive validity adjusting for self-report and mono-method bias

Before predicting work role performance from PERMA +4, we conducted a descriptive analysis of the bias items. Respondents indicated that their self-reports were more likely to be inaccurate (64%, n = 208) than accurate (36%, n = 116). On the other hand, collateral-reports were more likely to be accurate (90%, n = 294) than inaccurate (10%, n = 30). We then tested *Hypothesis 2* that self-reported PERMA+4 will significantly predict self-reported and collateral-reported work role performance. As demonstrated in Table 4, self-reported PERMA+4 was a significant predictor of self-reported work role performance, consisting of organizational adaptivity (β = .95, 95% CI [.90, 1.01], p < .01, R^2 = .73), organizational proactivity (β = .94, 95% CI [.88, .99], p < .01, R^2 = .69), and organizational proficiency (β = .98, 95% CI [.92, 1.04], p < .01, R^2 = .72). Adjusting for self-reports that were most likely to be accurate, the parameter estimates and the proportion of variance explained in work role performance, beside organizational proficiency (β = 1.01, 95% CI [.90, 1.13], p < .01, R^2 = .72), decreased across organizational adaptivity (β = .91, 95% CI [.80, 1.02], p < .01, R^2 = .67), organizational proactivity (β = .87, 95% CI [.75, .98], p < .01, R^2 = .66). Finally, self-reported PERMA+4 predicting collateral-reported work role performance showed the smallest regression parameters for organizational adaptivity (β = .84, 95% CI [.77, .91], p < .01, R^2 = .57), organizational proactivity (β = .85, 95% CI [.78, .93], p < .01, R^2 = .56), and organizational proficiency (β = .87, 95% CI [.81, .94], p < .01, R^2 = .60). Table 4 demonstrates support for *Hypothesis 2*.

Hypothesis 3 suggested collateral-reported PERMA+4 will significantly predict self-reported and collateral-reported work role performance. As demonstrated in Table 5, self-reported PERMA+4 was a significant predictor of self-reported work role performance, consisting of

Table 4. Self-Reported PERMA+4 predicting self-reported and collateral-reported work role performance.

	Self-Reports (n = 442)			Adjusted Self-Reports* (n = 126)			Collateral-Reported (n = 426)		
Work Role Performance	*b*	95% *CI*	R^2	*b*	95% *CI*	R^2	*b*	95% *CI*	R^2
Organizational adaptivity	.95	(.90–1.01)	.73	.91	(.80–1.02)	.67	.84	(.77-.91)	.57
Organizational proactivity	.94	(.88-.99)	.69	.87	(.75-.98)	.66	.85	(.78-.93)	.56
Organizational proficiency	.98	(.92–1.03)	.72	1.01	(.90–1.13)	.72	.87	(.81-.94)	.60

All regression parameters were statistically significant (p < .01). * = These are the participants who are most likely to be accurate.

Table 5. Collateral-Reported PERMA+4 predicting collateral-reported and self-reported work role performance.

	Collateral-Reported (n = 426)			Collateral-Reported* (n = 307)			Self-Reported (n = 434)		
Work Role Performance	*b*	95% *CI*	R^2	*b*	95% *CI*	R^2	*b*	95% *CI*	R^2
Organizational adaptivity	.95	(.90–1.00)	.77	.94	(.87–1.01)	.70	.83	(.76-.89)	.58
Organizational proactivity	.98	(.93–1.03)	.77	1.01	(.94–1.08)	.71	.82	(.75-.89)	.55
Organizational proficiency	.99	(.93–1.03)	.80	.96	(.89–1.03)	.72	.86	(.80-.93)	.60

All regression parameters were statistically significant (p < .01). * = Collateral-reported bias correction.

organizational adaptivity (β = .95, 95% CI [.90, 1.00], p < .01, R^2 = .77), organizational proactivity (β = .98, 95% CI [.93, 1.03], p < .01, R^2 = .67), and organizational proficiency (β = .99, 95% CI [.93, 1.03], p < .01, R^2 = .80). After correction for biased collateral-reports, the parameter estimates and the proportion of variance explained in work role performance, beside organizational proactivity (β = 1.01, 95% CI [.94, 1.08], p < .01, R^2 = .72), decreased across organizational adaptivity (β = .94, 95% CI [.87, 1.01], p < .01, R^2 = .70), organizational proficiency (β = .96, 95% CI [.89, 1.03], p < .01, R^2 = .72). Finally, self-reported PERMA+4 predicting collateral-reported work role performance showed the smallest regression parameters for organizational adaptivity (β = .83, 95% CI [.76, .89], p < .01, R^2 = .58), organizational proactivity (β = .82, 95% CI [.75, .89], p < .01, R^2 = .55), and organizational proficiency (β = .86, 95% CI [.80, .93], p < .01, R^2 = .60). Table 5 demonstrates support for *Hypothesis 5*.

Discussion

Findings advance knowledge about PERMA+4, work role performance, and about the role of self-report and mono-method bias in contemporary workplace research, particularly among studies that utilize positive work and organizations measures. The findings have important implications: 1) monomethod correlations between PERMA+4 and work role performance were inflated compared to heteromethod correlations, and 2) overall, adjusting for self-report bias and knowledgeable coworker-reports attenuated regression parameters and coefficients of determination, which were observed to be the smallest in heteromethod (i.e., self-reported PERMA+4 predicting collateral-reported work role performance) regression parameters. Taken together, this study provides sound empirical evidence that PERMA+4 can be predictive of work role performance. It also illustrates how important it is that researchers and practitioners are cautious when interpreting findings from cross-sectional monomethod designs based solely on self-report measures, perhaps the most popular design used in applied positive psychology research (e.g., Ackerman et al., 2018 estimated 78% of empirical articles in positive psychology use some type of self-report measurement scale, with 68% using only self-report measurements). That is, the majority of empirical studies examining positive psychology-related constructs to date may be reporting inflated estimates of the relationships between key constructs.

Our multitrait-multimethod matrix in this study showed support for the reliability and convergent validity of PERMA+4 and work role performance, as well as partial support for discriminant validity based on the validation criteria proposed by D. T. Campbell and Fiske (1959). Values in the validity diagonals between PERMA+4 and work role performance showed strong positive correlations (> .68) between self-reports and collateral-reports. These convergence findings support *Hypothesis 1a*. Findings from the last three criteria for discriminant validity were mixed (*Hypotheses 1b-d*). For example, the validity diagonal for PERMA+4 was higher than correlations between PERMA+4 and work role performance values in heteromethod blocks (*Hypothesis 1b*). However, values in monomethod blocks showed inflated correlations in line with or above values in the validity diagonal.

D. T. Campbell and Fiske (1959) reviewed multitrait-multimethod matrices in the psychological measurement literature and found that the three criteria for discriminant validity were rarely met. We found support for discriminant validity for the Positive Functioning at Work Scale (PERMA+4), but less support for the Work Role Performance Scale. Griffin et al. (2007) suggested that differentiating among work role performance subdimensions may pose a problem for collateral-reports because they may make an overall evaluation of the employee. Other factors such as the coworker's relationship to the incumbent, individual personality characteristics, and judgmental biases are all potential sources of error among collateral reports (Epstein, 1983). In addition, question wording, format, and the traits under investigation may also bias survey responses for both self- and collateral-reports. Future studies would benefit

from exploring, in more depth, the personal and working relationship of the coworker pairs to further control for motivational sources of bias.

PERMA+4 was a significant predictor of work role performance for self-reports and collateral-reports, thus supporting *Hypotheses 2 & 3*. Notably, 64% of employees in our sample agreed that their self-reports may be inaccurate and that they had some concern their answers could get back to their supervisor. On the other hand, 90% of employees in our sample reported knowledgeable collateral-reports. Donaldson and Grant-Vallone (2002) found that employees with a propensity to give socially desirable responses reported more favorable workplace behaviors, particularly if the participants feared the repercussions of reporting it to researchers. This may help explain the monomethod bias observed in the multitrait-multimethod matrix (Table 3). Social cognitive and communicative biases may also influence subjective appraisals of positive functioning in the workplace. For example, Higgins (1991) found that knowledge retrieval can be truncated based on subjective interpretation of past events, and varies by chronically accessible or temporarily accessible information. That is, self-reported judgments of meaning may be more chronically accessible and stable than a state-based factor like positive emotions when it comes to formulating an agreement-based survey response.

Bias adjusted and heteromethod self-reports reduced parameter estimates and variance explained compared to monomethod parameters (e.g., self-reports predicting collateral-reports and vice versa). A meta-analytic review of job attitudes and organizational citizenship behavior found that self-reports inflated correlations compared to other-ratings (Organ & Ryan, 1995). Donaldson and Grant-Vallone (2002) suggest the patterns observed between self-reports and collateral-reports can function as a confidence interval, indicating that the true score may lie between the two parameter estimates. Positive organizational psychology researchers should consider using multiple independent methods of data when possible instead of relying so heavily on the sole use of self-reports, and work harder to avoid presenting potentially misleading cross-sectional survey findings with inflated parameter estimates due to monomethod and self-report bias.

Limitations and future directions

There are some study limitations that deserve further attention. First, the MTMM data collected in this study was cross-sectional. Future MTMM positive organizational psychology research could employ longitudinal designs to future our understanding of how key relationships hold up or change over time. Second, we included two positive work and organizations constructs. Watson et al. (1987) suggest that measures of negative affect are also likely to bias relationships and would serve as a compliment to the positive constructs administered in the current study. Thus, future studies should include undesirable workplace behaviors, such as job stress and turnover intentions, to further understand the role of self-report bias on correlations and parameter estimates. Third, we found support for predictive validity between PERMA+4 and work role performance. However, from our cross-sectional survey data we are unable to establish a causal relationship. Future laboratory research, including randomized control trials, could help delineate temporal precedence and third variable explanations between PERMA+4 and work role performance.

Future MTMM studies in positive psychology might also consider collecting data from more than one collateral report and using more objective measures when possible to further increase the precision of important parameter estimates. MTMM research using diverse samples that incorporate multiple measures from employees of a variety of backgrounds could also help us better understand diversity, equity, and inclusion issues in the modern global workplace (Rao & Donaldson, 2015; Warren et al., 2017). Finally, findings from this study and similar studies using multiple independent sources of data can help researchers limited to the sole use of self-reports better interpret and understand the implications of their findings.

Conclusion

The current study expanded upon findings from traditional paper-and-pencil or online self-report surveys by using a knowledgeable co-worker pair design to understand positive psychological topics in the workplace. While self-report surveys are usually inexpensive, easy to use, and impressively accurate at times (Lucas et al., 1996), they may often suffer from motivational self-report biases. MTMM research designs serve as a compliment to the much more common sole use of self-report survey design and can help establish convergent validity. The findings of this research provided validation that PERMA+4 is predictive of work role performance when using both self-reported and collateral-reported data. However, the impact of self-report and monomethod bias on the relationship between PERMA+4 and work role performance suggested that empirical findings in the positive work and organizations literature may include uncontrolled inflated or deflated parameter estimates. MTMM analyses can increase confidence in the validity of research findings

and promise to advance the understanding of the theory, science, and practice of positive psychology.

Acknowledgements

The authors would like to sincerely thank colleague Mashi Rahmani, Ph.D. for his continuous support of our flourishing and social justice research program.

Disclosure statement

No potential conflict of interest was reported by the author(s).

Data availability statement

The data described in this article are openly available in the Open Science Framework at https://doi.org/10.17605/OSF.IO/TPA6U.

Open Scholarship

This article has earned the Center for Open Science badge for Open Data. The data are openly accessible at https://doi.org/10.17605/OSF.IO/TPA6U.

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