

Pride and guilt predict pro-environmental behavior: A meta-analysis of correlational and experimental evidence

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ARTICLE INFO

Handling Editor: Sander van der Linden

Keywords:

Pro-environmental behavior
Anticipated emotions
Experienced emotions
Random-effects meta-analysis

ABSTRACT

A rich body of empirical research has posited pride and guilt are psychological forces that affect pro-environmental behavior, yet there is conflicting evidence about how these emotional concepts shape pro-environmental behavior. We report on results from the first meta-analysis that has evaluated the associations of pride and guilt in relation to pro-environmental behavior over a 30-year period. An analysis of 23 correlational studies showed that anticipated pride ($r = 0.47$) and anticipated guilt ($r = 0.39$) were significantly correlated with intended and reported pro-environmental behavior, and that anticipated pride had a stronger relationship with behavior than guilt. Results from 12 experimental studies indicated that pride ($r = 0.17$) and guilt ($r = 0.26$) were equally strong in their ability to explain variation in pro-environmental behavior. Additionally, a moderator analysis revealed that in experimental studies the effects of both anticipated pride and guilt were significantly correlated with pro-environmental behavior but did not differ from one another, whereas only experienced guilt (and not pride) predicted intended and reported actions. These findings underscore the importance of cumulating previous research to systematically understand the mechanisms that shape patterns of pro-environmental behavior.

1. Introduction

To what extent do the emotions of pride and guilt influence pro-environmental behavior (PEB)? Pride and guilt are self-conscious emotions defined as feelings that arise from a self-evaluation of one's behavior in accordance with normative beliefs (Tangney et al., 2007). In the environmental psychology literature, there is a rich theoretical and empirical basis for studying linkages between personal norms and engagement in pro-social behaviors that benefit the environment (e.g., norm activation model; Schwartz, 1977). Research on pro-social behaviors built on the ideas of altruism provide a foundation for understanding PEB, which we define as intent-oriented actions directed at minimizing negative impacts on the environment (Stern, 2000). Although pride and guilt have received widespread attention as forces that relate to PEB (e.g., Adams et al., 2020; Bissing-Olson et al., 2016; Koenig-Lewis et al., 2014; Onwezen et al., 2014; Schneider et al., 2017), there is conflicting evidence about the extent to which they promote behavioral engagement. That is, the relative strength of these emotions in explaining PEB has been hotly debated (e.g., Harth et al., 2013;

Koenig-Lewis et al., 2014; Onwezen et al., 2013; 2014). Further, some authors have argued that pride (Adams et al., 2020) and guilt (Bissing-Olson et al., 2016) do not affect PEB. Given this conflicting evidence, we conducted a meta-analysis, with additional moderator analysis, to account for and systematically explain variability in the empirical relationships among pride, guilt, and PEB.

2. Background

2.1. Theoretical underpinnings of pride, guilt, and PEB

Both pride and guilt are discrete emotional concepts (Tangney et al., 2007) that consist of distinct physiological and neurological states that are accompanied by self-conscious psychological feelings (Adolphs, 2017; Fox, 2018). Pride and guilt are both "self-conscious" emotions that are a function of self-reflection. Pride is a positive feeling about performing desired behaviors, whereas guilt is a negative feeling that arises when beliefs about acceptable conduct are violated (Lewis, 2008; Tracy & Robins, 2007). These emotions and their relationship with PEB can be

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<https://doi.org/10.1016/j.jenvp.2021.101753>

Received 20 October 2020; Received in revised form 22 December 2021; Accepted 24 December 2021

Available online 29 December 2021

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further understood as being anticipated or experienced, as well as described by other characteristics included in supplemental information (see detailed inclusion criteria).

Relationships between the emotional concepts of pride and guilt in relation to PEB are predominantly studied using several theoretical frameworks. First, appraisal theory (Frijda, 1986; Scherer et al., 2001; Smith & Ellsworth, 1985) suggests that emotional experiences occur in response to how people consciously or subconsciously evaluate events, behaviors, or personally significant stimuli. Because pride and guilt are self-conscious and associated with personal or social normative beliefs, appraisal theory posits that people should experience pride or guilt in situations where their own behaviors related to the environment are evaluated in accordance with personal standards (Tangney et al., 2007; Tracy & Robins, 2006; 2007), and that emotions promote different judgments and action tendencies (Scherer et al., 2001). For example, if a person is proud of their behavior, they will likely feel a desire to maintain those behaviors and share their successes with others (Tracy & Robins, 2007). Whereas if this individual feels guilty, they will likely cease action and seek to make reparations, apologize, or gain forgiveness (Tangney & Dearing, 2003). While appraisal theory is useful to describe the general relationships among pride and guilt, it also provides insight on broad patterns of behavior including PEB.

The norm activation model of prosocial behavior (Schwartz, 1977) and the value-belief-norm theory of environmentalism (Stern, 2000) are also frameworks that guide research on PEB. This body of work contends that PEBs are motivated by moral normative concerns (Schwartz, 1977) that explain patterns of behavior (Bamberg & Möser, 2007; Klöckner, 2013). Related work suggests that when an individual internalizes feelings about adhering to or violating a sense of obligation, they experience one of several self-conscious moral emotions, including pride and guilt (Tangney et al., 2007). Additional work has posited that because pride and guilt arise in response to feelings of obligation, that these emotions act as mediators between normative concerns and PEB (Onwezen et al., 2013). Stated plainly, if a person holds a strong belief that they should protect the environment, then when they act in pro-environmental ways, they should feel proud of their actions, and in turn, become more likely to engage in PEBs. However, if the same person fails to act pro-environmentally, they would feel guilty, and consequently cease to harm that environment. Together, both the norm activation model and value-belief-norm theory thus provide a theoretical basis for understanding how moral normative concerns interface with the emotions of pride and guilt that motivate PEBs.

2.2. Possible sources of variability among pride, guilt, and PEB relationships

Previous research that has examined how pride and guilt affect PEB consists of both correlational and experimental studies. While pride and guilt are psychological phenomena that motivate PEBs, these emotions may also arise from an individual's decisions (Antonetti & Maklan, 2014). Therefore, correlational evidence alone may be insufficient for establishing pride and guilt as antecedents to PEB. Concerns about inferring causality from correlational evidence have been raised in psychology (Sussman & Gifford, 2019) and scholars have therefore emphasized the importance of experimental evidence for understanding the causal role of emotions in shaping PEB (Chapman et al., 2017). Meta-analyses, in particular, have distinguished between correlational and experimental evidence in assessments of factors that predict PEB (Bamberg & Möser, 2007; Mackay & Schmitt, 2019).

Scholars have recognized the role of 'anticipated' and 'experienced' emotions in explaining PEB. Whereas experienced emotions are the subjective feelings that arise from physiological and neurological reactions triggered by an object, another person, or event (Baumeister et al., 2007; Schlösser et al., 2013), anticipated emotions are expected to be felt as an outcome of future behavioral decisions (Baumeister et al., 2007; Kahneman, 2000; Schlösser et al., 2013). Given these differences,

Adams et al. (2020) called for research that distinguishes between anticipated and experienced feelings of pride and guilt to further understand drivers of PEB. These authors suggested that experienced guilt may be more strongly correlated with PEB than experienced pride because guilt shapes behavior by indicating something is wrong and needs immediate attention. Conversely, pride is associated with maintenance of current behaviors that promote complacency rather than higher engagement; however, this feeling is also associated with promoting a desire to achieve future accomplishments (Lewis, 2008). In other words, feelings of anticipated pride may "pull" a person to engage in a desired behavior, whereas guilt may "push" people away from undesired behaviors because they are motivated to avoid their occurrences (Schneider et al., 2017).

Pro-environmental behaviors can be conceptualized in different ways, particularly across the reporting of future intentions, previous reported activity, and observed behavior (e.g., Onwezen et al., 2014). Intended PEBs reflect a person's readiness or willingness to engage in behavior, reported PEBs are a person's self-report of previous action, and observed behaviors are directly witnessed (Huffman et al., 2014). These distinctions are important because some emotional concepts like pride promote the potential of achieving behaviors in the future (Lewis, 2008). Previous research has also examined how pride and guilt relate to different types of PEBs (e.g., Harth et al., 2013). For example, one distinction is between private-sphere behaviors (i.e., behaviors that reduce personal impact on the environment) and public-sphere behaviors (i.e., nonactivist behaviors that support public policies or environmental organizations) (Landon et al., 2018). Understanding how pride and guilt affect private- and public-sphere behaviors is important because private behaviors are less subject to social pressures and have different levels of persistence (Dayer et al., 2018). Other research has indicated that public and private PEBs may be influenced differently by antecedents such as knowledge or environmental worldviews (Liobikienė & Poškus, 2019). Although pride and guilt each promote engagement in different types of PEBs (Harth et al., 2013), no research to date has systematically examined how these emotions shape public versus private PEBs.

Methodological and socio-demographic features can reveal sources of variability in research findings. Commonly examined study features used in previous meta-analyses include factors such as age, gender, location where the study was conducted, and the population that was sampled (e.g., Mackay & Schmitt, 2019). Differences in experimental conditions or treatments have also emerged as potential sources of variability in previous research. Specifically, experimental manipulations used to study the effects of pride and guilt on PEB have included behavioral feedback (Adams et al., 2020) and message framing (e.g., infographics about human influence on the environment; Swim & Bloodhart, 2015). There is thus a strong need for future research to account for the effects from potential sources of variability, especially in systematic reviews.

2.3. Present study

In this study, we assessed the empirical relationships among the emotions of pride and guilt in relation to PEB within a meta-analytic framework. We first examined these relationships by investigating the correlational effect sizes between measures of pride and guilt with measures of PEB from data obtained through correlational and cross-sectional analyses, as well as experimental studies. After modeling correlational and experimental research separately, we conducted moderator analyses to identify and explain sources of heterogeneity among study effects. We first examined the moderating effects of methodological and socio-demographic features including publication type, study location, sample age, and gender following standard practices (Card, 2015; Mackay & Schmitt, 2019). We then tested the moderating effects of different theoretically relevant characteristics including pride, guilt, and PEB. For both correlational and experimental

studies, we determined whether study effects differed between measures of anticipated and experienced emotions, intended versus reported/observed PEBs, and public versus private PEBs. We also tested whether study effects in experimental research differed based on the type of manipulation.

3. Methodology

We conducted a meta-analysis following recommendations from the literature (Card, 2015; Haddaway et al., 2015) and standardized our reporting procedures following the Preferred Reporting Items for Systematic Reviews and Meta-analyses (Moher et al., 2009). The processes for our analysis first involved a systematic review of the literature. We then extracted Pearson's correlations between the emotions of pride and guilt with intended and reported/observed PEBs and then conducted our analyses.

3.1. Detailed inclusion criteria

Eligibility for inclusion in our meta-analysis was evaluated according to several criteria. The selected articles needed to include: 1) a measure of pride and/or guilt, and 2) a measure of PEB. We identified studies that measured pride as either an anticipated or experienced state emotion of pride that related to engaging in PEBs and excluded studies that measured collective feelings of pride, trait dispositions to feel pride, or pride unrelated to protecting the environment. Similarly, we identified studies that measured guilt as either an anticipated or experienced state emotion of personal guilt related to protecting the environment and excluded studies that measured collective guilt, other self-conscious negative emotions (e.g., shame), trait dispositions of guilt, or guilt unrelated to protecting the environment (for additional information on our inclusion criteria for pride and guilt see the detailed inclusion criteria in supplemental documentation). We included studies that measured PEB as either intended, reported, or observed and excluded studies that lumped PEB into measures of other phenomena (e.g., attitudes, beliefs, perceptions). The final inclusion criterion was a correlation or sufficient data to calculate a correlational effect size between a measure of pride or guilt and PEB. We elected to use correlational coefficients as the effect size for our meta-analyses for both correlational and experimental studies because it was a single metric that could be obtained from all studies and given that many experimental studies did not provide enough data to calculate a mean difference score.

3.2. Literature search and text screening for inclusion

Our initial systematic search involved gathering articles from a variety of peer-reviewed scholarly databases, including Web of Science, SCOPUS, Sage Knowledge, PsycINFO, and JSTOR. We also searched sources of grey literature (e.g., ProQuest) to identify unpublished work and reduce the effects of publication bias (Dwan et al., 2008). Our initial search was conducted between August and December, 2018. Search criteria required articles to be primary research published in English between 1988 and 2018 that reported enough results to calculate a correlational effect size. We searched databases using a combination of words and truncations related to the emotional concepts of pride and guilt and PEB. To ensure relevant articles were identified, we used broad terms drawn from past research that were related to pride and guilt including *emotion*, *affect*, *mood*, and *feelings* as well specific emotional concepts including *pride*, *guilt*, *accomplishment*, *confident*, *regret*, *shame*, *remorse*, *sorry*, *worthwhile*, and *pleased with myself* (Adams et al., 2020; Onwezen et al., 2013). We also searched using modifiers of terms such as *anticipated pride*, *anticipated guilt*, *experienced pride*, and *experienced guilt*. Terms related to PEB included *pro-environmental behavior*, *environmental behavior*, *conservation behavior*, *environmentally significant behavior*, *environmental awareness*, *environmental stewardship*, *environmental concern*, and *environmental protection*. This initial search returned 33,226

articles, of which 17,749 were duplicates and removed, leaving 15,477 articles that were further screened.

We first assessed eligibility by reading article titles and abstracts. This initial screening reduced the original pool to 421 articles. We then downloaded the 421 articles and conducted a backward and forward search. The backward search involved reviewing all titles in each article's reference list to identify candidate articles for inclusion. We used articles collected during the initial and backward searches to conduct a forward search, where we used Google Scholar to identify articles that had cited any of the previously included articles. In sum, the backward and forward searches produced a pool of 495 articles that were screened and reduced to 69 articles for full-text screening. During this stage of our search, we also contacted authors directly to request unpublished data that fit our search criteria, which produced two articles. To ensure that our findings were comprehensive and up to date, we conducted additional searches to include articles up to publication year 2021. We conducted this additional step in-between the peer review process for this present manuscript, which produced an additional 26 articles. In total, our search produced 518 articles.

We evaluated eligibility for inclusion in our meta-analysis by conducting a full-text screen of all 518 articles and applying our inclusion criteria. Overall, 130 articles were removed because they did not measure PEB per our definition. Examples of ineligible articles measured outcomes such as moral reasoning, attitudes towards sustainability, wildlife perceptions, and beliefs about climate change. We also excluded 237 articles that did not measure emotions and 60 articles that measured emotions but did not measure either an emotion of pride or guilt. Articles that did not include the specific terms of pride and/or guilt in their measurement were removed. Based on our criteria, we excluded 7 articles that were reviews or theoretical papers, 33 that were qualitative, and another 21 for not providing enough data to calculate a correlational effect. Notably, we excluded one seminal study (i.e., Bissing-Olson et al., 2016) because the methodology was neither correlational nor experimental and therefore did not fit our criteria. All steps of article searching and classification for inclusion were conducted across four researchers such that each article was reviewed by at least two people. After all steps of screening and inclusion criterion were applied, our search achieved high intercoder reliability for inclusion (86% agreement; Belur et al., 2018). All inconsistencies among inclusion were discussed by the authors prior to final inclusion. Our final search produced 30 articles that were deemed eligible for inclusion in this meta-analysis.

3.3. Data extraction and coding

The final step before analysis required abstracting and coding all included studies. Our first step for data extraction involved identifying and recording the Pearson's correlation (r) between the emotional concepts of pride and guilt with PEB. In circumstances where the correlation between pride and guilt with PEB was not reported, we calculated the correlation by using standard techniques to convert other commonly reported statistics (Card, 2015). In situations where no correlations were reported, or we were unable to calculate a correlation, we contacted authors directly to acquire correlation tables. All subsequent data extraction and coding was conducted by the first author who reviewed and coded all articles twice on separate occasions, being blind to the first review and codes, which created an intracoder reliability between both occasions (Card, 2015). Intracoder reliability for final study inclusion/exclusion eligibility was high and deemed acceptable (95% intracoder agreement; Orwin & Vevea, 2009). Any uncertainty in study eligibility was then evaluated in tandem between the first and second author.

For each of the 30 included articles, we recorded general demographic and study information. General information that was recorded included the author's name and year of publication. We also coded publications as either peer-reviewed or unpublished, which included

dissertations, theses, or unpublished data. Demographic information that was recorded included the sample size, mean age of participants, proportion that reported they were female, location of study by country, and if the sample was a student population. Because continuous moderators can produce inaccurate meta-analytic results (Hunter & Schmidt, 2004) we re-coded age and proportion female into categorical ranges of high and low using a median split to achieve a more parsimonious and valid understanding of how effects differ between these demographic features (Iacobucci et al., 2015). We also coded methodology as either correlational or experimental following Mackay and Schmitt (2019). For experimental studies we coded the type of experimental manipulation. Experimental manipulations that were used to elicit emotional responses included presenting a visual infographic or film about the environment and human's influence on the environment (message frame, e.g., Swim & Bloodhart, 2015), asking participants to recall and/or write about a time they experienced an emotional event (narrative, e.g., Lu & Schuldt, 2015), and providing feedback on participant behavior (behavioral feedback, e.g., Adams et al., 2020).

The final study features that were extracted pertained to measures of emotions and PEB. We first recorded whether the emotion was pride or guilt. We also recorded if the emotion was anticipated or experienced (Adams et al., 2020; Baumeister et al., 2007). For each PEB, we recorded whether the behavior was intended, self-reported, or observed (Huffman et al., 2014). After collecting data we observed there were too few studies that measured self-reported or observed behaviors to reliably use these categories as moderators so we lumped self-reported and observed behaviors into a single category of "reported/observed" that was used to compare with behavioral "intentions." We also coded each PEB as either private-sphere, public-sphere, or general based on existing classifications (Liobikienė & Poškus, 2019; Stern, 2000).

3.4. Data analysis

An assumption of meta-analyses is that effect sizes are independent so when effect sizes are nested then multilevel meta-analyses can be used to account for dependence among the true effects and covariance of the sampling errors (Konstantopoulos, 2011; Viechtbauer, 2010). Many of the included articles reported multiple measures of pride, guilt, and different PEBs, which produced dependent correlations. To account for dependence in effect sizes we first developed a multilevel model to test random intercepts for between- and within-study effects (Van Houwelingen et al., 2002). More specifically we created a between study effect by nesting effect sizes within studies, thus accounting for intraclass correlations among the effect sizes. We did this procedure for both pride and guilt and then separated correlational from experimental methods, which resulted in four meta-analytic models. We found that modeling random-slopes at the study level did not significantly improve model fit and removing this slope did not alter our results; for the sake of parsimony we therefore removed the random-slopes at the study level (Harrer et al., 2019). We then conducted our analysis using either random- or mixed-effects meta-analysis (Card, 2015). For each model we used restricted maximum likelihood estimation (Viechtbauer, 2007), assessed total model heterogeneity using Cochran's Q -test and the I^2 statistic (Jackson et al., 2012; Viechtbauer, 2010), and evaluated the proportion of variance explained by moderators by calculating a pseudo- R^2 as the proportional reduction of model variance. We conducted all data analyses in R (version 3.6.1) using the 'metafor' package (version 2.1-0; Viechtbauer, 2010).

We followed four steps to calculate the meta-analytic effects from our models. The first step was to transform each Pearson's correlation coefficient (r) into Fisher's z . Given that Pearson's r is not normally distributed (Card, 2015), we utilized Fisher's transformation to create normally distributed variables to model meta-analytic effects. Fisher's transformation is a common technique in meta-analysis (Card, 2015); however, Fisher's z is not bound by plus or minus 1. For ease of interpretation, we converted all effect sizes back to Pearson's r in our results

(Card, 2015). For the second step we weighed each effect size by using inverse standard errors (Card, 2015). Our third step involved estimating a random-effects model to calculate a pooled effect size (Konstantopoulos, 2011; Viechtbauer, 2010), which we did using a restricted maximum likelihood (REML) estimator. Our final step involved assessing the influence of moderating variables using mixed-effects models to assess how effects varied across different predictor variables and to explain additional heterogeneity across studies (Card, 2015; Hedges & Olkin, 2014).

3.5. Publication bias and sensitivity analyses

Meta-analyses are prone to produce inflated estimates because of publication biases which result from statistically significant results being more likely to be published than non-significant findings (Card, 2015). We assessed publication bias by visualizing the distribution of effect sizes and standard error along the pooled estimated effects, which is a method to identify "asymmetry" in the effect sizes. We also assessed asymmetry using Egger's regression test of funnel plot asymmetry which provides a statistical measure of skewness (Egger et al., 1997). Additionally, we performed a moderator analysis to compare effect sizes between published and unpublished articles to assess whether unpublished articles were statistically weaker, which would be an indicator of possible "file drawer" problems whereby smaller non-significant results are less likely to be published (Rosenthal, 1979). To examine the sensitivity of our findings we identified potential outliers using Cook's distances, residuals, and a Baujat plot, then re-ran the models without outliers to assess their influence (Viechtbauer & Cheung, 2010). We assessed the precision of our models by evaluating the fit of model parameters using profile likelihood plots (Konstantopoulos, 2011).

4. Results

Our meta-analysis included 100 unique effect sizes, produced from 35 studies that originated from 30 manuscripts. The collective sample size across all studies was 19,472 participants. The flow of information through the different phases of the review process can be seen in Supplemental Fig. 1. Descriptive information for all studies can be found in Supplemental Table 1 through 4. All model parameters were well estimated according to profile likelihood plots for each model (Supplemental Figs. 2 and 3). All results are reported as pooled effects unless otherwise indicated (e.g., PEB intentions are lumped with reported/observed PEB in all meta-analytic models except where explicitly distinguished).

4.1. Correlational studies

In total, we identified 21 manuscripts using correlational methods that were included in our meta-analysis to understand how pride and guilt related to PEB. These articles included 23 studies and produced 62 unique effect sizes. None of the included correlational studies measured pride or guilt as an experienced emotion, in that all were specific to anticipated feelings of pride and guilt. Estimated parameters from a random-effects model indicated that the pooled effect between anticipated pride and pooled intended and reported/observed PEBs was positive and statistically significant ($r = 0.47$, 95% CI [0.44, 0.50], $z = 25.11$, $p < .001$) and the effect between anticipated guilt and all pooled intended and reported/observed PEBs was positive and statistically significant ($r = 0.39$, 95% CI [0.34, 0.43], $z = 15.33$, $p < .001$). A comparison between anticipated pride and guilt in the mixed-effect model indicated that the pooled effect between pride and PEB was statistically more positive than the pooled effect between guilt and PEB ($z = 3.18$, $p = .002$). Output from random-effects models indicated that high heterogeneity was present for the pooled effect between anticipated pride and PEB ($Q_{(30)} = 198.94$, $p < .001$, $\tau^2 = 0.011$, $I^2 = 87\%$) and between anticipated guilt and PEB ($Q_{(30)} = 348.25$, $p < .001$, $\tau^2 = 0.020$,

$I^2 = 93\%$), indicating a need to test moderators to explain variability in the effects. Model results are shown in Table 1 and two forest plots that chart the heterogeneity of observed effects for pride and guilt are displayed in Supplemental Figs. 4 and 5.

4.1.1. Publication bias and sensitivity analysis for correlational studies

We found little evidence of publication bias and uncertainty from sensitivity analyses. Results from a mixed-effects model comparing the moderating effect of study publication status indicated that the pooled effect between anticipated pride and PEB as well as between anticipated guilt and PEB did not differ between published and unpublished studies (see Table 1). No asymmetry in funnel plots of model parameters was detected and Egger’s regression test of asymmetry was non-significant for the effect of pride ($z = 1.79, p = .07$) and guilt ($z = 0.41, p = .68$). No outliers were detected based on Cook’s distance, residuals, or on a Baujat plot (Supplemental Figures 6 through 10).

4.1.2. Influence of study demographic characteristics in correlational studies

Estimated effects from mixed-effect models indicated that the pooled effects between anticipated pride and PEB and between anticipated guilt and PEB across correlational studies were statistically significant across all study demographic features – except for effects of guilt in student samples – indicating that pride and guilt statistically correlated with pooled intended and reported/observed PEBs across most socio-demographic characteristics (see Table 1 for results of all demographic moderator analyses). Results and post-hoc analysis of a mixed-effect model that examined the moderating effect of study mean age indicated that studies with lower mean age reported a weaker correlation

between pride and PEB compared to studies with higher mean age ($z = -2.34, p = .02$), which explained 13 percent of the variability among effects. All other mixed-effect models of study demographic features as moderators indicated that pooled effects were not statistically different based study on demographic characteristics, suggesting that variability among effects was less likely attributed to study socio-demographics and that other sources of heterogeneity should be examined.

4.1.3. Influence of emotion and PEB characteristics in correlational studies

Notably, we were unable to compare differences between anticipated and experienced emotions from correlational data because no correlational studies reported measures of experienced pride or guilt. Other results of mixed-effect models indicated that the pooled effects of anticipated pride and guilt were significantly correlated with both general and private PEB and were significantly correlated with PEB intentions and measures of reported/observed PEB (see Table 2 and Fig. 1). Additional output of these mixed-effect models indicated that the pooled effect for the correlations between anticipated pride and PEB intentions ($r = 0.50, 95\% \text{ CI } [0.47, 0.53]$) was significantly more positive than the pooled effect for the correlations between anticipated pride and reported/observed PEB ($r = 0.39, 95\% \text{ CI } [0.33, 0.44], z = 3.62, p < .001$), which explained 34 percent of the variability among the effects. Other mixed-effect model results indicated that the pooled correlation between anticipated guilt and PEB did not differ between PEB intentions and reported/observed PEB or between general and private PEB (see Table 2).

Table 1
Summary of estimated mean effects for pride and guilt by study demographic features from correlational studies.

Moderator	r	95% CI	z	s, k	Q _w	I ²	Q _b	R ²
Pride	.47***	[.30, .62]	25.11	21, 31	198.94***	87%		
Pride: publication					197.31***	86%	1.77	.01
Published	.48***	[.31, .63]	10.71	17, 24				
Unpublished	.43***	[.24, .59]	22.93	4, 7				
Pride: location					180.31***	85%	0.27	.00
United States	.49***	[.30, .64]	15.52	8, 12				
Non-U.S.	.47***	[.29, .62]	18.15	11, 17				
Pride: sample					191.74***	87%	1.24	.00
Student	.37***	[.17, .54]	3.51	1, 1				
Non-student	.48***	[.44, .51]	24.97	20, 30				
Pride: gender ^a					198.50	87%	0.03	.00
≥ 52.4% female	.47***	[.42, .51]	17.40	11, 16				
< 52.4% female	.47***	[.43, .52]	17.54	10, 15				
Pride: age ^a					179.00***	85%	6.10*	.13
Missing	.49***	[.44, .54]	15.52	8, 10				
≥ 38.6	.50***	[.45, .57]	17.90	8, 12				
< 38.6	.41***	[.35, .47]	12.40	5, 9				
Guilt	.39***	[.34, .43]	15.33	21, 31	348.25***	93%		
Guilt: publication					348.24***	93%	0.02	.00
Published	.38***	[.28, .47]	6.97	4, 7				
Unpublished	.39***	[.34, .44]	13.37	17, 24				
Guilt: location					332.51***	92%	0.40	.00
United States	.41***	[.33, .47]	9.99	9, 13				
Non-U.S.	.38***	[.31, .44]	10.32	10, 16				
Guilt: sample					333.63***	92%	1.28	.01
Student	.24	[-.04, .49]	1.68	1, 1				
Non-student	.39***	[.35, .43]	15.35	20, 30				
Guilt: gender ^a					334.05***	92%	1.85	.03
≥ 52.4% female	.36***	[.29, .42]	11.86	11, 16				
< 52.4% female	.42***	[.35, .47]	10.12	10, 15				
Guilt: age ^a					321.07***	92%	2.58	.02
Missing	.38***	[.30, .45]	8.97	9, 11				
≥ 38.6	.42***	[.35, .49]	10.77	8, 12				
< 38.6	.33***	[.24, .42]	6.75	4, 8				

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

Note: r is reported as Pearson’s correlation coefficient, s represents the number of studies, k represents the number of unique effect sizes, Q_w is reported as total residual heterogeneity, Q_b is reported as test of moderators.

^a Dichotomous categories created using on median split.

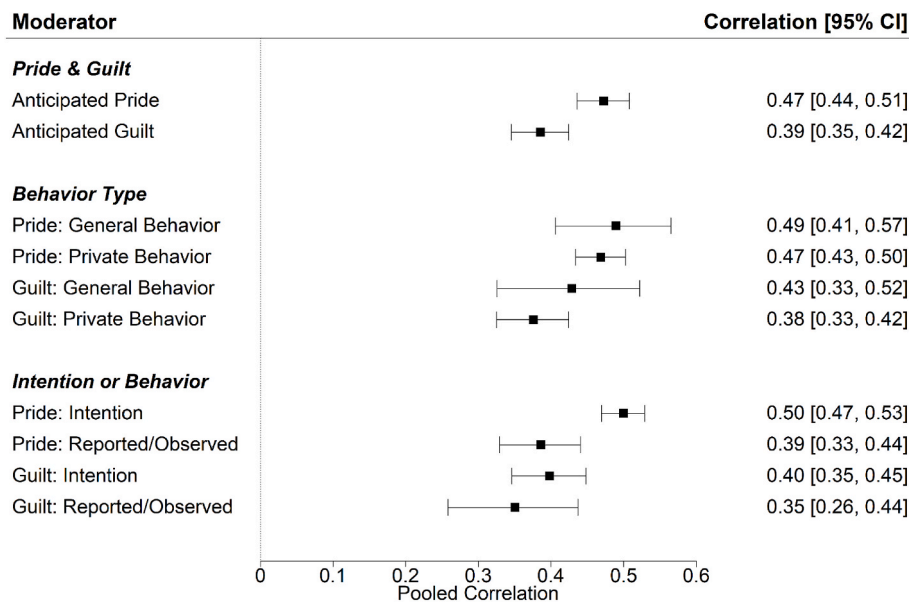


Fig. 1. A summary plot for model parameters estimates for each model estimated using data extracted from correlational studies. The mean effect and the 95% confidence intervals (CI) are reported and displayed as correlation coefficient (*r*).

Table 2

Summary of estimated mean effects for pride and guilt by behavioral and emotional characteristics from correlational studies.

Moderator	<i>r</i>	95% CI	<i>z</i>	<i>s, k</i>	<i>Q_w</i>	<i>I</i> ²	<i>Q_b</i>	<i>R</i> ²
Pride: behavior type					192.61***	87%	0.22	.00
General	.49***	[.41, .57]	10.04	4, 5				
Private	.47***	[.43, .50]	22.73	18, 26				
Pride: behavior intention					151.36***	81%	13.10	.34
Intention	.50***	[.47, .53]	27.23	19, 23				
Reported/Observed	.39***	[.33, .44]	12.15	4, 8				
Guilt: behavior type					325.19***	93%	0.86	.00
General	.43***	[.33, .52]	7.46	5, 6				
Private	.38***	[.33, .42]	13.41	17, 25				
Guilt: behavior intention					339.85***		0.83	.00
Intention	.40***	[.35, .45]	13.61	19, 23				
Reported/Observed	.35***	[.26, .44]	7.02	4, 8				

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

Note: *r* is reported as Pearson's correlation coefficient, *s* represents the number of studies, *k* represents the number of unique effect sizes, *Q_w* is reported as total residual heterogeneity, *Q_b* is reported as test of moderators.

4.2. Experimental studies

Overall, we identified 10 manuscripts that examined the relationship between pride and guilt in relation to PEB using experimental methods, which comprised 12 studies and produced 38 unique effect sizes. Unlike the correlational studies included in our analysis, experimental studies provided measures of both anticipated and experienced pride and guilt. Therefore, we first compared pooled effects of pride and guilt for both anticipated and experienced measures of pride and guilt then examined the moderating effects in subsequent analyses. Model estimates from a random-effects model indicated that across these studies the pooled effect between pride and pooled intended and reported/observed PEBs was positive and statistically significant (*r* = 0.17, 95% CI [0.10, 0.25], *z* = 4.32, *p* < .001) and the pooled effect between guilt and pooled intended and reported/observed PEBs was positive and statistically significant (*r* = 0.26, 95% CI [0.19, 0.33], *z* = 6.91, *p* < .001). Additional results from a subsequent mixed-effect model revealed that the pooled effect between pride and pooled intended and reported/observed PEBs was not statistically different from the pooled effect between guilt and PEBs (*z* = 1.59, *p* = .11). Output of the random-effects models indicated high heterogeneity was present among the effects between pride and PEB (*Q*₍₁₇₎ = 209.39, *p* < .001, *τ*² = 0.025, *I*² = 91%) and the effects

between guilt and PEB (*Q*₍₃₀₎ = 233.69, *p* < .001, *τ*² = 0.025, *I*² = 92%) which afforded additional moderator analyses. Model results are shown in Table 3 and the variability of study effects for pride and guilt are displayed in Supplemental Figs. 11 and 12.

4.2.1. Publication bias and sensitivity analysis for experimental studies

Results from publication bias and sensitivity analyses revealed little evidence of publication bias but did indicate possible bias due to overly influential outliers. Results from a mixed-effects model indicated that the pooled effect between pride and PEB and between guilt and PEB were not statistically significantly different between published and unpublished studies (see Table 3). No asymmetry was detected in funnel plots of model parameters and Egger's regression test of asymmetry was non-significant for the effect of pride (*z* = -0.95, *p* = .34) and guilt (*z* = 1.91, *p* = .06). We detected a possible outlier for the effect of guilt on PEB based on Cook's distance and residuals (Viechtbauer & Cheung, 2010); however, we elected to not remove this outlier because no differences in model parameters were observed after removal. No other outliers were detected based on Cook's distance, measures of influence, or Baujat plots (see Supplemental Figures 13 through 17).

Table 3
Summary of estimated mean effects for pride and guilt by study demographic features from experimental studies.

Moderator	<i>r</i>	95% CI	<i>z</i>	<i>s, k</i>	<i>Q_w</i>	<i>I</i> ²	<i>Q_b</i>	<i>R</i> ²
Pride	.17***	[.10, .23]	4.32	9, 18	209.39***	91%		
Pride: publication					209.27***	91%	0.31	.00
Published	.16**	[.06, .25]	3.07	6, 11				
Unpublished	.20**	[.07, .33]	2.96	3, 7				
Pride: location					197.60***	91%	1.50	.03
United States	.19***	[.11, .27]	4.55	7, 16				
Non-U.S.	.03	[-.20, .27]	0.27	2, 2				
Pride: sample					207.18***	92%	0.20	.00
Student	.12	[-.11, .35]	1.02	2, 3				
Non-student	.18***	[.10, .26]	4.14	7, 15				
Pride: gender ^a					161.53***	90%	1.51	.04
≥ 50% female	.13*	[.03, .23]	2.56	6, 11				
< 50% female	.23***	[.11, .34]	3.79	3, 7				
Pride: age ^a								
Missing data	.13	[-.17, .40]	0.84	1, 2	114.10***	87%	8.47*	.35
≥ 34.8	.27***	[.18, .35]	5.73	3, 8				
< 34.8	.08	[-.02, .17]	1.51	5, 8				
Guilt	.26***	[.19, .33]	6.91	10, 20	233.69***	92%		
Guilt: publication					177.63***	91%	2.65	.10
Published	.22***	[.14, .30]	5.08	7, 13				
Unpublished	.34***	[.22, .44]	5.39	3, 7				
Guilt: location					213.59***	91%	1.83	.05
United States	.26***	[.17, .31]	6.31	8, 18				
Non-U.S.	.39***	[.18, .57]	3.47	2, 2				
Guilt: sample					233.36***	92%	0.01	.00
Student	.27*	[.04, .47]	2.27	2, 3				
Non-student	.26***	[.18, .33]	6.39	8, 17				
Guilt: gender ^a					122.43***	88%	8.61**	.34
≥ 50% female	.34***	[.26, .41]	7.89	6, 11				
< 50% female	.16***	[.08, .25]	3.63	4, 9				
Guilt: age ^a					227.01***	92%	0.33	.00
Missing	.33*	[.02, .58]	2.07	1, 2				
≥ 34.8	.26***	[.16, .37]	4.71	4, 9				
< 34.8	.24***	[.13, .34]	4.28	5, 9				

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

Note: *r* is reported as Pearson's correlation coefficient, *s* represents the number of studies, *k* represents the number of unique effect sizes, *Q_w* is reported as total residual heterogeneity, *Q_b* is reported as test of moderators.

^a Dichotomous categories created using on median split.

4.2.2. Influence of study demographic characteristics in experimental studies

Estimated effects from mixed-effect models indicated that the pooled effect of guilt on pooled intended and reported/observed PEB were significant across demographic features, but the pooled effect of pride on pooled intended and reported/observed PEB were not significant for many study features, particularly research conducted outside of the United States, student-based samples, and younger samples (see Table 3). Additional results from mixed-effects model that examined the moderating effects of study socio-demographics indicated that the pooled effect of pride on PEB from studies with an older sample (*r* = 0.27, 95% CI [0.18, 0.35]) was significantly stronger than the pooled effect from studies with a younger sample (*r* = 0.08, 95% CI [-0.02, 0.17], *z* = -2.89, *p* = .004) and explained 35 percent of the variability among effects. Other results from moderator analyses indicated that the pooled effect of guilt on PEB from studies with a higher proportion of female respondents (*r* = 0.34, 95% CI [0.26, 0.41]) was significantly stronger than the estimated effect from studies with a lower proportion of female respondents (*r* = 0.16, 95% CI [0.08, 0.25] *z* = -2.94, *p* = .003) and explained 34 percent of the variability among effects. Other study socio-demographic moderators did not explain variability among effects (see Table 3 for all statistical tests).

4.2.3. Influence of emotion and PEB characteristics in experimental studies

Notably, results of mixed-effect models indicated that both anticipated and experienced measures of both pride and guilt were significant predictors of pooled intended and reported/observed PEB (see Table 4, Fig. 2). Output from these mixed-effects models indicated through moderator analyses that the pooled effect of anticipated pride was a

statistically stronger positive predictor of pooled intended and reported/observed PEB (*r* = 0.28, 95% CI [0.19, 0.37]) compared to experienced pride (*r* = 0.09, 95% CI [0.01, 0.17], *z* = 3.09, *p* = .002), which explained 40 percent of the variability in pride. In contrast, results from these models indicated that the pooled effect of anticipated guilt on pooled intended and reported/observed PEB (*r* = 0.25, 95% CI [0.14, 0.36]) was not statistically different from the pooled effect of experienced guilt (*r* = 0.26, 95% CI [0.16, 0.35], *z* = 0.08, *p* = .114). Post-hoc analysis of these mixed-effect models indicated the pooled effect of experienced guilt was statistically stronger and more positive than the effect of experienced pride (*z* = 2.59, *p* = .001), but there was no difference in the pooled effect of anticipated pride and guilt on PEBs.

Across experimental studies, the pooled effects of pride and guilt obtained from mixed-effect models were significant predictors of most types (i.e., general, public, and private) and measures (i.e., intention or reported/observed) of PEB. One exception was that the pooled effect of pride on reported/observed PEB was not significant. Moderator analyses indicated that pooled effects did not differ between any behavior types or measures of PEB for both pride and guilt. (see Table 4, Fig. 2).

Final results estimated from a mixed-effect model indicate that the pooled effect of pride and guilt on pooled intended and reported/observed PEB differed based on the type of experimental manipulation (see Table 4, Fig. 2). The estimated pooled effect of pride on PEB was significant when the experimental manipulation was a message frame (*r* = 0.18, 95% CI [0.08, 0.28]) or narrative (*r* = 0.26, 95% CI [0.12, 0.40]), but not if the manipulation was through behavioral feedback (*r* = 0.06, 95% CI [-0.09, 0.21]). In contrast, the pooled effect of guilt was significantly related to PEB when manipulations were either through behavioral feedback (*r* = 0.26, 95% CI [0.16, 0.35]) or a message frame

Table 4
Summary of estimated mean effects for pride and guilt by methodological, behavioral, and emotional characteristics from correlational studies.

Moderator	<i>r</i>	95% CI	<i>z</i>	<i>s, k</i>	<i>Q_w</i>	<i>I</i> ²	<i>Q_b</i>	<i>R</i> ²
Pride: emotion type					105.17***	86%	9.55**	.40
Anticipated	.28***	[.19, .37]	5.89	2, 7				
Experienced	.09*	[.01, .17]	2.07	7, 11				
Pride: behavior type					183.76***	91%	0.85	.00
General	.14*	[.01, .26]	2.17	5, 8				
Private	.23**	[.08, .37]	2.96	4, 5				
Public	.17*	[.02, .31]	2.20	3, 5				
Pride: behavior intention					196.52***	91%	0.36	.00
Intention	.19***	[.10, .27]	3.99	9, 14				
Reported/Observed	.13	[-.04, .29]	1.54	4, 4				
Pride: manipulation type					113.57***	89%	3.82	.15
Behavioral feedback	.06	[-.09, .21.]	0.77	2, 4				
Message frame	.18***	[.08, .28]	3.53	5, 10				
Narrative	.26***	[.12, .40]	3.51	2, 4				
Guilt: emotion type					213.99***	92%	0.01	.00
Anticipated	.25***	[.14, .36]	4.28	3, 8				
Experienced	.26***	[.16, .35]	5.21	7, 12				
Guilt: behavior type					232.86***	92%	0.32	.00
General	.23***	[.12, .34]	3.90	6, 9				
Private	.27**	[.08, .44]	2.77	2, 3				
Public	.28***	[.16, .38]	4.60	5, 8				
Guilt: behavior intention					233.16***	92%	0.49	.00
Intention	.27***	[.19, .35]	6.37	10, 16				
Reported/Observed	.21*	[.05, .36]	2.51	4, 4				
Guilt: manipulation type					68.49***	78%	28.00***	.66
Behavioral feedback	.26***	[.16, .35]	5.14	2, 4				
Message frame	.35***	[.29, .41]	10.38	6, 11				
Narrative	.07	[-.02, .15]	1.59	2, 5				

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

Note: *r* is reported as Pearson’s correlation coefficient, *s* represents the number of studies, *k* represents the number of unique effect sizes, *Q_w* is reported as total residual heterogeneity, *Q_b* is reported as test of moderators.

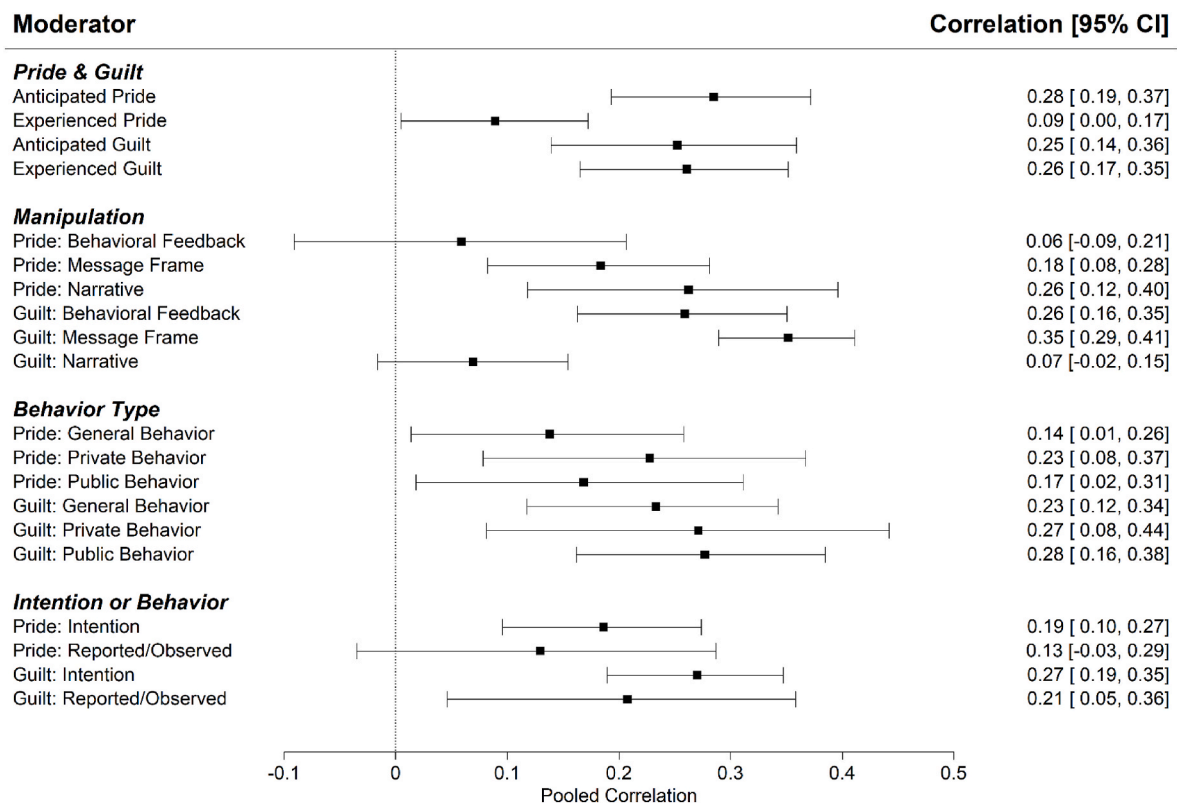


Fig. 2. A summary plot for model parameters estimates for each model estimated using data extracted from experimental studies. The mean effect and the 95% confidence intervals (CI) are reported and displayed as correlation coefficient (*r*).

($r = 0.35$, 95% CI [0.29, 0.41]) but not in narrative manipulations ($r = 0.07$, 95% CI [-0.02, 0.15]). Post-hoc analyses of model output indicated that the pooled effect of guilt on PEB from behavioral feedback and message frame experimental manipulations were both statistically stronger than the pooled effect from narrative experimental manipulations ($z = 2.89$, $p = .004$ and $z = 5.29$, $p < .001$; respectively), which explained 66 percent of the variability among the effects. The pooled effect of pride did not statistically differ among the experimental manipulations.

5. Discussion

In this meta-analysis, we examined previous research conducted over a 30-year period to explain variation in the relationship between the emotional concepts of pride and guilt in relation to PEB. Evidence from correlational studies indicated that the weighted pooled correlation between pride and both intended and reported/observed PEB was significant and had a medium to large effect size ($r = .47$). Similar evidence was found for the weighted pooled correlation between guilt and both intended and reported/observed PEB, which had a medium effect size ($r = 0.39$; Cohen, 2013). Our pooled correlation between guilt and PEB aligned with previous meta-analyses that reported a medium effect for guilt on PEB and a medium to large effect on PEB intentions (Bamberg & Möser, 2007). These findings extend previous research by providing the first estimated meta-analytic effect between pride and both intended and reported/observed PEB. Furthermore, drawing on results from our moderator analysis, we suggest the pooled correlations between pride and PEB are slightly stronger than correlations between guilt and PEB (Onwezen et al., 2014).

Our assessment of experimental research indicated that the weighted pooled correlation between pride and PEB was small and statistically significant ($r = 0.17$) and that the correlation between guilt and PEB was small to medium and statistically significant ($r = 0.26$). However, we found the difference between the relationship of pride and guilt in relation to both intended and reported/observed PEB was not different in experimental research. This result extends previous research, some of which has indicated pride exerts a stronger influence on PEB than guilt (Schneider et al., 2017) while others have suggested guilt has a stronger influence (Adams et al., 2020; Swim & Bloodhart, 2015). Our finding that pride and guilt did not have a different influence on PEB in experimental studies lies in contrast to previous research and suggests that more work is needed to identify and examine the contexts in which pride and guilt exert different influences on PEB. While findings from this analysis utilize correlational coefficients to estimate effect sizes, the experimental design of the analyzed studies provide supporting evidence for a causal relationship between the emotions of pride and guilt with PEB, which addresses an expressed need to better understand the causal linkages between emotions and PEB (Adams et al., 2020; Chapman et al., 2017).

Notable in our findings was the difference between the influence of anticipated and experienced pride and guilt on PEB. In correlational research that only included measures of anticipated emotions, pride exerted a greater influence on PEB than guilt. This finding aligns with previous research suggesting that the “pull” effect of anticipated pride would more strongly correlate with PEB (Onwezen et al., 2014). By contrast, the pooled effects from experimental studies from our meta-analysis indicated correlations of anticipated pride and guilt in relation to PEB were equal, while experienced guilt, but not pride, had a significant and positive effect on PEB. This finding aligns with previous experimental research suggesting that experienced guilt, but not experienced pride, predict engagement in PEB (Adams et al., 2020). However, the non-significant difference between anticipated pride and guilt estimated from experimental studies contradicts previous studies that have suggested anticipated feelings of pride are more powerful than guilt in their ability to encourage PEB (Schneider et al., 2017). Differences in the effects of both anticipated and experienced pride and guilt

on PEB need to be more systematically evaluated to determine how these psychological processes motivate behavior change.

In line with previous correlational research (e.g., Bissing-Olson et al., 2016), this study revealed that anticipated pride had a stronger relationship with intended PEB intentions than reported/observed PEB. Indeed, pride promotes the maintenance of current behaviors and triggers a desire to take action in the future because people strive for positive rather than negative emotions. Yet, guilt is still a relevant determinant of behavior because people are also motivated to avoid negative emotions (Lewis, 2008). Another result, to our surprise, was that we did not detect a difference in the correlations between pride and guilt in relation to PEB based on behavior type (i.e., general, public, or private) or intentionality (i.e., intended or reported/observed behavior). Given that phenomena such as knowledge and beliefs predict different levels of engagement in private versus public PEB (Liobikiene & Poškus, 2019), future work should more carefully examine how pride and guilt motivate engagement in different types of PEB, especially considering that guilt motivates reparations whereas pride motivates achievement oriented action (Harth et al., 2013; Tangney & Dearing, 2003; Tracy & Robins, 2007).

We observed differences among the pooled correlations of pride and guilt with PEB based on the type of experimental manipulation used in previous research. The pooled correlation between pride and PEB was positive and statistically significant in experimental studies that used message frames and narratives but not in behavioral feedback. It could be that when people feel proud of their current PEBs, they become less likely to perform new PEBs or even reduce their current level of engagement (see Adams et al., 2020 for a detailed discussion). The pooled correlation between guilt and PEB was positive and significant in experimental studies that employed behavioral feedback and message framing manipulations but was not significant in studies that used narratives. This finding could be attributed to the fact that people desire to feel positive rather than negative emotions (Lewis, 2008), and when asked to imagine a guilty experience via narrative manipulation, may be biased to recall fewer negative experiences. Importantly, the type of experimental manipulation was the only significant moderator of relationships between guilt and pro-environmental behavior, accounting for 66 percent of variation in study effects.

5.1. Limitations and areas for future research

Multiple areas of future research stem from this study. One important consideration for interpreting our findings is the role of criteria to identify relevant literature for inclusion in a meta-analysis. Conducting meta-analyses requires carefully balancing broad vs narrow scopes to reduce problems of comparing apples to oranges (Cortina, 2003). Therefore, we enforced strict inclusion criteria in this study to minimize heterogeneity while maximizing the number of articles selected. Consequently, our analysis was limited to 35 studies, only 12 of which were experimental, and some studies were authored by the same researcher. It could be that some of the effects detected could have been attributable to similar study designs adopted by the same authors, which may have biased our results. Additionally, we focused on the effects of pride and guilt on PEB, which differ in their valence. That is, pride is a positive and pleasant emotion whereas guilt invokes unpleasant feelings. It is possible that our results were a function of differences in valence rather than the qualities of pride and guilt as distinguishable emotional concepts. A final limitation is that high heterogeneity was present in all models after enforcing strict inclusion criteria. While moderator analysis explained some variability (i.e., distinguishing anticipated from experienced pride explained 40 percent of variability among effects), the high amount of residual heterogeneity suggests there could be additional underlying factors that were not accounted for in our meta-analysis (Card, 2015). Given the smaller number of experimental studies included in this study, future research should continue conducting experimental research on the role of pride and guilt in

motivating PEB.

Several areas of future research should be prioritized in response to what was learned from the current study. First, longitudinal research should be conducted to understand how reactions and experiences of pride and guilt shift and change over time (Böhm & Pfister, 2008; Chapman et al., 2017), how these changes shape subsequent PEB (Bissing-Olson et al., 2016), and how overexposure to pride and guilt may result in reactance and diminished engagement in PEB (Adams et al., 2020; Schneider et al., 2017). Secondly, future research should continue to examine how other social-psychological factors such as attitudes and norms modify the effects of pride and guilt shape on PEB (Bissing-Olson et al., 2016; Onwezen et al., 2014). Lastly, there are many other discrete types of emotions (e.g., anger, fear, worry, and hope) that were beyond the scope of this study but that warrant future research attention.

6. Conclusion

As the first systematic analysis of the relationship between pride and guilt in relation to PEB, results from 35 studies and 100 effect sizes indicate that both pride and guilt affect PEB. Specifically, our analysis of correlational evidence indicates that anticipated pride and guilt are statistically correlated with intended and reported/observed PEB and that PEB is more strongly influenced by anticipated pride than anticipated guilt. Through an analysis of experimental evidence, we suggest that pooled effects of pride and guilt are statistically correlated with PEB. Our moderator analyses indicate that both experienced and anticipated guilt predict PEB, but anticipated (and not experienced) pride relate to PEB. Experimental studies further reveal that differences in manipulation moderate the correlations between pride and guilt in relation to PEB. These reported patterns identify areas where future research can elucidate the psychological forces that shape PEB.

Author contributions

Nathan Shipley: Conceptualization, Methodology, Software, Formal analysis, Data curation, Writing – original draft, Writing - Review & Editing, Project administration. **Carena van Riper:** Conceptualization, Funding, Writing – Review & Editing.

Data availability & code availability

Our data used in this paper can be found here: <https://osf.io/a6nsb/>.

Declaration of competing interest

The authors declare no competing interests.

Acknowledgements

We would like to thank Haley Ware and Tracy Pham for their assistance in reviewing articles. We would also like to thank Benjamin White for his insights regarding statistical analysis. This research was conducted under the support of United States Department of Agriculture National Institute of Food and Agriculture grant [#2018-68002-27918] and University of Illinois, College of Agricultural, Consumer, and Economic Sciences Future Interdisciplinary Research Explorations [grant #ILLU-741-380]. Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the authors and do not reflect the view of our funding agencies.

Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jenvp.2021.101753>.

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