

Exploring the Secrecy Burden: Secrets, Preoccupation, and Perceptual Judgments

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Recent work suggests that secrecy is perceived as burdensome. A secrecy–burden relationship would have a number of consequences for cognitive, perceptual, social, and health psychology, but the reliability of these influences, and potential mechanisms that support such influences are unknown. Across 4 studies, the current work examines both the reliability of, and mechanisms that support, the influence of secrecy processes upon a judgment that varies with diminished resources (i.e., judgments of hill slant). The current work finds that a manipulation of secret “size” fails to reliably predict judged hill slant, whereas measurement and manipulation of preoccupation with a secret does reliably predict judged hill slant. Moreover, these effects are found to be mediated by judged effort to keep the secret, consistent with a resource-based mechanism of the burdens of secrecy.

Keywords: secrecy, perception, coping, resources

Secrecy involves the active concealment of information from others. Active inhibition is depleting (Critcher & Ferguson, 2014), and individuals describe keeping a secret as being burdensome, or physically weighing one down (e.g., “carrying a secret”; Slepian, Masicampo, Toosi, & Ambady, 2012). These processes might have consequential outcomes for well-being. Indeed, keeping secrets brings negative consequences for mental and physical well-being (Cole, Kemeny, Taylor, & Visscher, 1996; Cole, Kemeny, Taylor, Visscher, & Fahey, 1996; Rodriguez & Kelly, 2006). Given close links of secrecy with physical and mental processes (see Pennebaker, 1989), one topic that has received recent attention is that of the bodily based perceptual consequences of secrecy and guilt. For example, secrecy elicits guilt (Frijns & Finkenauer, 2009; Vangelisti, 1994), and a growing body of literature demonstrates that people link guilt with the sensation of carrying weight (Day & Bobocel, 2013; Kouchaki, Gino, & Jami, 2014). For example, sensations of weight enhance feelings of guilt (Kouchaki et al., 2014), and feelings of guilt enhance sensations of weight (Day & Bobocel, 2013). Being forgiven, however, reduces feelings of burden, as demonstrated by reduced judgments of hill slant (Zheng, Fehr, Tai, Narayanan, & Gelfand, 2014), as does feelings of being understood (Oishi, Schiller, & Gross, 2013), and being sup-

ported (Schnall, Harber, Stefanucci, & Proffitt, 2008), or being affirmed (reducing judgments of distance; Shea & Masicampo, 2014). As these examples suggest, carrying information alone, without others’ support and understanding, (i.e., secrecy) can influence perceived burden. Holding secrets can affect people in the same way that carrying physical weight does—people who carry consequential secrets act and make judgments as if they are physically burdened (Slepian et al., 2012).

Despite this growing body of literature, which suggests links between physical and mental processes in the domain of secrecy, a number of important questions remain. Given that secrecy has been associated with diminished physical health (Cole, Kemeny, Taylor, & Visscher, 1996; Cole, Kemeny, Taylor, Visscher, & Fahey, 1996), it is critical to understand how secrecy might actually influence perceived burden to shed light on its health consequences. Additionally, it is important to know how robust prior demonstrated links are. Demonstrating that secrecy can lead to perceived burden has a number of consequences for cognitive, perceptual, social, and health psychology (e.g., with implications for judgments of physical space, social cognition and interpersonal relations, and coping with secrecy). It is thus important to understand how reliable the links between secrecy and experienced burden might be, and how best to operationalize secrecy in a manner that allows for insights into how secrecy influences bodily based perceptual judgments. The current work focuses on judgments of hill slant to examine these questions as such judgments have been reliably linked to experiences of burden.

One method used in prior work to examine whether secrecy can be burdensome has asked participants to recall “big” versus “small” secrets (based on random assignment), and then provide a number of judgments, including the judgment of hill slant.

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Judgments of hill slant have been reliably linked to experiences of physical burden in prior work (for a review see Proffitt, 2006). That is, judgments are scaled to the ability to interact with the external environment (Cole & Balci, 2013; Eves, 2014; Proffitt, 2006; Witt, Proffitt, & Epstein, 2004). Thus, if one feels that he or she has fewer resources available to act upon the external environment, that environment is judged as more challenging. Judging the environment as more challenging leads to judgments of that environment as being more forbidding and extreme (e.g., judging hill slant as steeper with fewer perceived resources to scale the hill).¹ In one of four studies, Slepian and colleagues (2012) found that recalling “big,” relative to “small,” secrets led to steeper judgments of hill slant, consistent with the hypothesis that secrecy is perceived as physically burdensome. A recent article, however, failed to find an influence of a manipulation that asks participants to recall “big,” relative to “small,” secrets on judgments of hill slant (LeBel & Wilbur, 2014). The goal of the current work was to examine how reliably secrecy processes influence judgments that vary with perceived burden. To accomplish this goal, the current authors examined the replicability of the original work, with a special focus on understanding if, when, and how secrecy can be burdensome.

Comparing any replication attempt to the original work, considerations can be made at two different levels of analysis: the *operationalization* level and the *phenomenon* level. These different levels of analysis are content-general (i.e., can apply to any domain of interest), but we discuss them here in the domain of the burdens of secrecy.

Beginning first with the lower level, the operationalization level, we can wonder whether a failure to replicate the effect of recalling “big” and “small” secrets on judgments of hill slant simply suggests that the relationship between this exact manipulation and this exact dependent measure is nonexistent or weak. That is, perhaps secrets are indeed burdensome, but the precise manner in which secrets are being manipulated, or burden is measured, is suboptimal—the operationalizations are imprecise. If the link between the specific operationalization of burdensome secrets and the specific operationalization of burden-like outcomes is nonexistent, we should not expect an exact replication of the original study to be successful (i.e., we would see a failure to replicate the effect of the “big” vs. “small” secret recall manipulation on judgments of hill slant). Use of other, more precise operationalizations, however, may yield support for the notion that secrets produce burden-like outcomes.

Moving to the phenomenon level, we can wonder whether a failure to replicate indicates that the broader phenomenon (i.e., of secrecy leading to perceived burden) does not exist. If so, then secrets will not be burdensome regardless of the particular methods used (e.g., the exact manipulation, the exact dependent measure, or both).

With respect to the current topic, a failure to replicate one operationalization of the hypothesis that secrecy is burdensome (LeBel & Wilbur, 2014) presents an important question: Does a failure to replicate the effect of recalling “big” versus “small” secrets on judgments of hill slant question the replicability of this particular methodology (i.e., does it speak to replicability at the operationalization level), or does it question whether secrecy pro-

cesses, more broadly, influence judgments of hill slant (i.e., does it speak to replicability at the phenomenon level)?

As reviewed above, a growing body of work that uses a diverse array of dependent measures (judgments of hill slant, judgments of distance, jumping height, judgments of the weight of objects, judgments of body weight) suggests that the burden of secrets leads to outcomes that resemble physical burden (Day & Bobocel, 2013; Slepian et al., 2012; Slepian, Masicampo, & Ambady, 2014; Susewind, Christandl, & Hoelzl, 2013; see also Critcher & Ferguson, 2014; Kouchaki et al., 2014). In contrast, elements that relieve the burden of secrecy, such as feeling understood, affirmed, supported, in control, or forgiven, reduce burden-consistent outcomes (reducing judgments of hill slant, distance, and felt weight; Lee & Schnall, 2014; Oishi et al., 2013; Schnall et al., 2008; Shea & Masicampo, 2014; Zheng et al., 2014).

Thus, a converging body of evidences demonstrates that having to carry information alone, without support, is burdening, whereas being relieved (e.g., by being understood, affirmed, supported, or forgiven) is unburdening. In addition to the reliability of conceptually similar measures, it is also important to know the reliability of specific dependent measures. We focus on one such dependent measure in the current work, judgments of hill slant. Thus, more specifically we can wonder whether a failure to find an influence of recalling “big” versus “small” secrets on judgments of hill slant suggests that this specific operationalization is suboptimal, or whether secrecy processes, more generally, do not reliably influence judgments of hill slant (a measure that tracks the experience of diminished resources). A simple way to test these interpretations against one another is to conduct an exact replication of the original study, thereby capturing the exact methodology to examine its replicability, but within the same study, add an alternative operationalization of the phenomenon. This would provide a simultaneous test, within the same participant sample, of two operationalizations of the more general hypothesis. Bonferroni correction can then be applied to account for the fact that examining

¹ *Judgments* of the external environment reflect one’s perceived capability to interact with the environment (see Witt, 2011). Whether *visual perception* of the environment can be altered by these processes, however, has been debated (cf. Firestone, 2013; Proffitt, 2013). A full discussion of the debate regarding judgments versus perception is outside of the scope of the current paper, but we wish to mention that the focus of the current work is on judgments of hill slant. We do not make claims about the *visual* perception of hill slant. Additionally, researchers (cf. Durgin et al., 2009; Proffitt, 2009) have debated the processes by which, specifically, wearing a heavy backpack influences hill slant judgments. Yet, this debate is confined to the backpack manipulation and judgments of hill slant (other work also debates the effect of throwing a heavy object; Woods, Philbeck, & Danoff, 2009). A variety of other physical burden variables (reduced action potential from advanced age, from fatigue, from low fitness, from pain) also predict judgments of hill slant (and distance), and these have not been suggested to be consequences of demand characteristics (Cole & Balci, 2013; Eves, 2014; Sugovic & Witt, 2013; Witt, Proffitt, & Epstein, 2004; Witt et al., 2009; see Proffitt, 2006). Thus, the debate surrounding the mechanisms by which heavy backpacks influence judgments of hill slant does not cast doubt on the relationship between physical burden and judgments, more generally, only specifically studies that use the backpack manipulation. Thus, this particular debate (which is far from settled; cf. Durgin, Klein, Spiegel, Strawser, & Williams, 2012; Proffitt, 2013; Witt & Sugovic, 2013) does not have any a priori relevance to the current work given that heavy backpacks are not used as manipulations in the current studies, nor did any participants intuit the experimental hypotheses or present any indication of demand effects in funneled debriefing.

replicability at the operationalization and phenomenon level within the same sample provides two opportunities to find a significant effect.

Burdensome Secrets: “Size” Versus Preoccupation

The current work takes a new approach to studying the secrecy burden, examining the role of how preoccupied one is by a secret, as well as how much effort one believes is needed to keep a secret. This approach, combined with examining the reliability of prior operationalizations, sheds light on the mechanisms of the burdens of secrecy, extending current theory on how secrecy processes impinge on bodily based responses. First, if secrecy does influence judgments of hill slant, then the specific operationalization of burdensome secrets as “big” rather than “small” in a recent failed replication (LeBel & Wilbur, 2014) may be suboptimal. The assumption underlying this operationalization is that “big” secrets are more personally relevant and influential than “small” ones and hence should be more burdensome (Slepian et al., 2012). However, we suspect that the “big” versus “small” distinction does not precisely capture the difference between personally influential and noninfluential secrets as was originally presupposed. That is, these terms may be underspecified. For example, consider the secret of infidelity. If one has come to terms with an infidelity, is accepting of it, and thus no longer upset by it, it may not be a subjectively influential secret, but one may nevertheless describe it as a “big” secret as it is conventionally treated as such. Indeed, simply committing infidelity is not burdensome, but rather it is the extent to which one treats one’s infidelity as consequential and spends time thinking about it that determines how burdensome it is (Slepian et al., 2012).

Thus, it might be that *preoccupation* with a secret is a more reliable indication of a secret’s gravity. Indeed, research on concealable stigma supports this suggestion. Among individuals who possess concealable stigmatized identities (e.g., sexual orientation, mental illness), the importance of their identity, the frequency with which they think about the identity, and the anticipated negative consequences of disclosing that identity mediate the effects of these identities on psychological distress (Quinn & Chaudoir, 2009). Additionally, the more individuals who committed an infidelity thought about their infidelity and were bothered by it, the more they perceived physical tasks as requiring effort (Slepian et al., 2012), suggesting that it is not the norm-based “size” of a secret that determines burden, but rather it might be the extent to which one is preoccupied with one’s secret that determines perceived burden. Asking participants to recall “big” versus “small” secrets, therefore, might not systematically lead to the recall of secrets that are personally influential or not, respectively. In other words, these terms may only weakly elicit influential and noninfluential secrets, thereby leading such a manipulation to sometimes succeed, but not always. We therefore examined whether more specific (and more carefully defined) measures and manipulations of the recall of preoccupying secrets would produce differences in judgments of hill slant, as this operationalization more closely captures the phenomenon of interest. We thus measured how preoccupied participants were by their secret. Preoccupation was assessed by three criteria: a) the amount a person thinks about his or her secret, b) how much one feels that the secret personally affects him or her, and c) how much it

bothers him or her. That is, preoccupation is not defined in this framework as mere cognitive accessibility (cf. Lane & Wegner, 1995), but rather represents the subjective motivational engagement one has with the secret.

Role of Effort

A body of evidence suggests that preoccupation as defined above should deplete resources for acting upon the environment (see Cole & Balcetis, 2013). That is, when preoccupied by a secret, one is devoting personal resources toward that secret. This increased preoccupation with the secret might suggest to the secret holder that increased effort is needed to keep the secret (and thus less effort is available for other pursuits). In other words, just as physical burdens lead to more extreme judgments of the environment by increasing the effort required to interact with it (e.g., Cole & Balcetis, 2013; Eves, 2014; Proffitt, 2006; Schnall, Zadra, & Proffitt, 2010; Witt et al., 2004), perhaps so does preoccupation with secrets.

This notion suggests a natural mediator to test between preoccupations with one’s secret and judgments of the environment as more forbidding and extreme, increased effort needed to keep the secret. When sizing up how steep a staircase is, for example, it will seem steeper if one has to carry a bag of groceries up the stairs, rather than an empty bag. The increased effort required by walking upstairs with something heavy, will lead the staircase to seem more forbidding, that is, steep (see Cole & Balcetis, 2013). In other words, the effort required to walk up a staircase in this example, mediates the relationship between how heavy the object one must carry is, and how steep the staircase looks. Likewise, we hypothesized that the effort required to keep a secret will mediate the relationship between how preoccupied one is by the secret and how steep a hill is judged. Specifically, we tested the hypothesis that preoccupying secrets (relative to nonpreoccupying secrets) will be judged as more effortful to keep, which will predict the judgment that the environment is more forbidding (i.e., a hill is more steep).

The Present Studies

Across four studies, we test both the reliability of, and mechanisms that support, the influence of secrecy upon judgments of hill slant. First, we test whether a previously used manipulation of secret “size” can reliably predict judged hill slant, or whether measurement of preoccupation with a secret is superior in that regard (Studies 1 and 2). We also tested whether a manipulation of preoccupation with a secret would show evidence of a causal link between secrecy preoccupation and burden-consistent outcomes, and whether this causal link is mediated by judged effort to keep the secret, consistent with a resource-based mechanism of the burdens of secrecy (Studies 3 and 4).

Study 1

In Study 1 we ask participants to recall “big” and “small” secrets as in Slepian and colleagues (2012, Study 1). We also measure a variable that we hypothesize more closely tracks the participant’s subjective sense of the gravity of the secret (i.e., how personally influential the secret is). We test this by measuring how preoccupied participants are by their secrets.

Method

Study 1 served as an exact replication of Slepian and colleagues' (2012) Study 1, with the inclusion of the additional aforementioned measurement of how preoccupied participants are by their recalled secrets. This study was preregistered on the Open Science Framework.² Thus, the methods, procedure, sample size, and analysis plan, including rules for data exclusions, were all committed to in advance of data collection (see Brandt et al., 2014). Sample size was determined by a recent proposal that replication attempts should recruit 2.5 times the sample size as the original study (Simonsohn, 2013). One hundred participants were thus recruited for each study in the current work, utilizing Mechanical Turk, which allowed for anonymous recall of secrets. All data exclusions, all manipulations, and all measures are reported for each study (see Simmons, Nelson, & Simonsohn, 2012).

Participants ($M_{\text{age}} = 30.44$ years, 54% female) were recruited for a study ostensibly on judgments about the workplace, and were given instructions for the study upon agreeing to participate (in lieu of a consent form). Participants read, "Before we ask you to rate objects and places, we are also interested in the psychology of secrets. We ask you to think about a big [small] secret that you have, one that you are purposefully keeping as a secret." On the next line, participants read, "Without revealing specific details about your secret, we are curious what it pertains to. Please write about your big [small] secret in the provided box." Participants were reminded that they could write as much as they would like and that responses were completely anonymous. Participants who wrote that they did not have a secret that met the qualifications of the prompt were excluded (as decided prior to data collection). Next, participants completed a measure of how preoccupied they were by their secret. Participants answered, "How much do you think about your secret?", "How much does it affect you?", and "How much does it bother you?" (from 1-not at all to 7-very much).

Next, in an ostensibly separate study, participants judged a series of control items (the sturdiness of a table, the durability of a water bottle, the temperature in degrees Fahrenheit of a park), and the critical dependent measure, the slant of a pictured hill. The former three items were standardized, and an average was taken as a measure of control numerical estimation. Participants were reminded that 0 degrees is a flat surface, while 90 degrees is a vertical surface, and therefore their estimation should be in between those two numbers. Participants whose responses did not fall in this range of values were also excluded from analysis (as decided prior to data collection).

In all studies, a JavaScript code was embedded into the Mechanical Turk recruitment, preventing individual Mechanical Turk users from participating in a study if they had previously participated in a secrecy study conducted by the authors. This code thus prevents repeat participants within the current work (across studies), and also across previous studies on the burdens of secrecy (i.e., those previously conducted by the current authors).

Results

Two participants in the "big" secret condition indicated that they did not have a secret that fit the prompt, and these participants were therefore excluded. The predetermined analysis plan was to conduct a 2 (condition) \times 2 (judgment type) ANOVA as in

Slepian and colleagues (2012, Study 1), as well as parallel analyses that examined whether the preoccupation measure predicted hill slant judgments, and control judgments.

"Big" versus "small" secrets. The 2 (condition: big secret, small secret) \times 2 (judgment type: hill slant, control estimates) ANOVA was conducted on standardized measures of hill slant and the control numerical estimation index (for ease of interpretation, untransformed slant estimates are presented in text; see Figure 1 for standardized means). This analysis revealed no main effect of condition ($n_{\text{big}} = 47$, $n_{\text{small}} = 51$), $F(1, 96) = 1.90$, $p = .17$, $\eta^2 = .02$, no main effect of judgment-type, $F(1, 96) < 0.01$, $p > .99$, $\eta^2 < .01$, and no interaction, $F(1, 96) = 1.33$, $p = .25$, $\eta^2 = .01$. Thus, recalling "big" versus "small" secrets did not differentially influence judgments of hill slant ($M_{\text{big}} = 39.72^\circ$, $SD = 18.42$; $M_{\text{small}} = 45.29^\circ$, $SD = 17.30$).

Preoccupation. Regressions were conducted to examine whether the preoccupation measure ($\alpha = .83$) predicted hill slant judgments, and the control numerical estimation index. Increased preoccupation with the recalled secret predicted increased hill slant judgments, $b = 2.28$, $t(96) = 2.27$, $p = .026$, but did not predict the control numerical estimation index, $b = .40$, $t(96) = 1.00$, $p = .32$.

Bonferroni correction. One could argue that because the current study is examining replicability at the operationalization level and the phenomenon level within the same sample of participants, this provides "two chances" to find a significant effect. A conservative answer to this concern would be to apply a Bonferroni correction, which requires taking the alpha-level used to assess significance and dividing it across the two tests, thereby requiring each test to meet the criterion of $\alpha = .025$ to be considered significant. The p value for the relationship between the preoccupation measure of secrecy and judgments of hill slant was $p = .026$. Thus, in the most conservative test, the link between secrecy preoccupation and judgments of hill slant was only marginally significant.

Discussion

Asking participants to recall "big" or "small" secrets, based on random assignment, did not influence judgments of hill slant. Yet a measure of how preoccupied participants were by their secret did show some evidence of predicting judgments of hill slant. The former finding presents a demonstration of nonreplicability at the operationalization level, whereby using the same variables from Slepian and colleagues (2012, Study 1), we did not find evidence for a relationship between secrecy and judgments of hill slant. The latter finding presents a demonstration of replicability at the phenomenon level, whereby a different operationalization of the gravity of a secret (how preoccupied one was by the secret) did predict hill slant judgments, lending support to the hypothesized phenomenon.

These findings provide initial evidence that perceived burden is related to secrecy processes, but not necessarily related to the manipulation of recalling "big" and "small" secrets. The link between secrecy preoccupation and hill slant judgments was perhaps only marginally significant. The p value for the relationship

² Retrieved from https://osf.io/7v5fd/?view_only=cfa19efafa1b45b2b5e957cbddcfca13

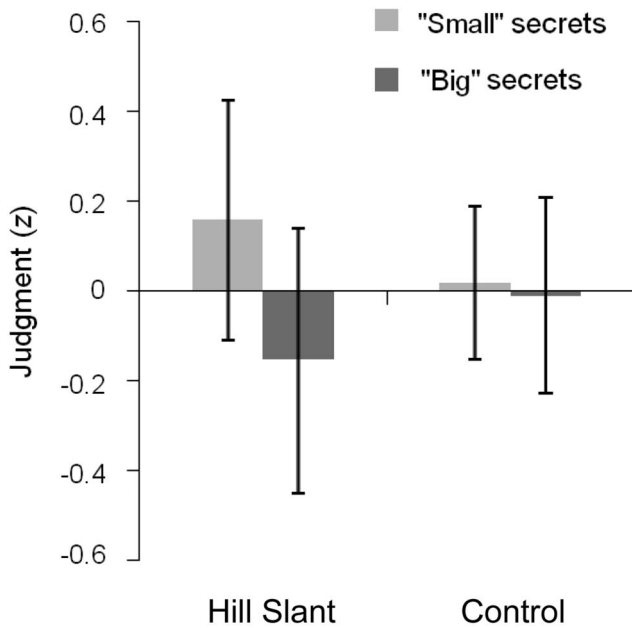


Figure 1. Standardized means of hill slant and control numerical judgments as a function of recalling “small” and “big” secrets in Study 1. Error bars denote 95% Confidence Intervals of the Mean.

between the preoccupation measure of secrecy and judgments of hill slant was $p = .026$. This could be considered “significant” or not, depending on which test one considers to be most appropriate (i.e., at the more stringent Bonferroni-corrected α -threshold of .025, it is as significant as is $p = .052$ when the α -level is set to .05). Given that the finding did not meet the strictest alpha-level, this suggested to us the importance of conducting an exact replication of the current Study 1 to examine the reliability of the current pattern of results.

Study 2

Method

Study 2 was an exact replication of Study 1, and thus utilized the same preregistered protocol, whereby the same methods, procedure, sample size ($N = 100$; $M_{\text{age}} = 29.48$ years, 55% male), and analysis plan, including rules for data exclusions, from Study 1 were used, and were committed to in advance of data collection.

Results

Two participants in the “small” secret condition, and one participant in the “big” secret condition, indicated that they did not have a secret that fit the prompt, and these participants were therefore excluded. The predetermined analysis plan was identical to Study 1: conducting a 2 (condition) \times 2 (judgment type) ANOVA as in Slepian and colleagues (2012, Study 1), as well as parallel analyses that examined whether the preoccupation measure predicted hill slant judgments, and control judgments.

“Big” versus “small” secrets. As in Study 1, the 2 (condition: big secret, small secret) \times 2 (judgment type: hill slant, control

estimates) ANOVA was conducted on standardized measures of hill slant and the control numerical estimation index (for ease of interpretation, untransformed slant estimates are presented in text; see Figure 2 for standardized means). This analysis revealed a main effect of condition ($n_{\text{big}} = 49$, $n_{\text{small}} = 48$), $F(1, 95) = 4.54$, $p = .04$, $\eta^2 = .05$, but no main effect of judgment-type, $F(1, 95) = 0.17$, $p = .68$, $\eta^2 = .002$. These effects were qualified, however, by a significant interaction, $F(1, 95) = 7.78$, $p = .006$, $\eta^2 = .08$.

To examine the nature of this interaction, follow-up tests examined the influence of condition on each variable. Asking participants to recall “big” secrets led them to make steeper hill slant judgments ($M = 43.45^\circ$, $SD = 18.04$) than participants asked to recall “small” secrets ($M = 34.02^\circ$, $SD = 14.34$), $t(95) = 2.85$, $p = .005$, $r = .28$. There was no difference, however, in the control numerical estimation index ($M_{\text{big}} = -.005$, $SD = .597$; $M_{\text{small}} = .010$, $SD = .605$), $t(95) = 0.12$, $p = .91$, $r = .01$.

Preoccupation. Regressions were conducted to examine whether the preoccupation measure ($\alpha = .84$) predicted hill slant judgments, and the control numerical estimation index. Increased preoccupation with the recalled secret predicted increased hill slant judgments, $b = 4.30$, $t(95) = 5.31$, $p < .0001$, but did not predict the control numerical estimation index, $b = .06$, $t(95) = 1.76$, $p = .08$.

Bonferroni correction. Despite Study 2 being an exact replication of Study 1, the most conservative analysis again requires a lower criterion at which to assess statistical significance. That is, examining replicability at the operationalization and phenomenon level, within the same participant sample, provides two opportunities to find a significant effect. As in Study 1, the most conservative answer to this concern divides the α -level used to assess significance across the two tests, requiring each test to meet the criterion of $\alpha = .025$ to be considered significant. The p value for the secrecy recall manipulation upon judgments of hill slant falls

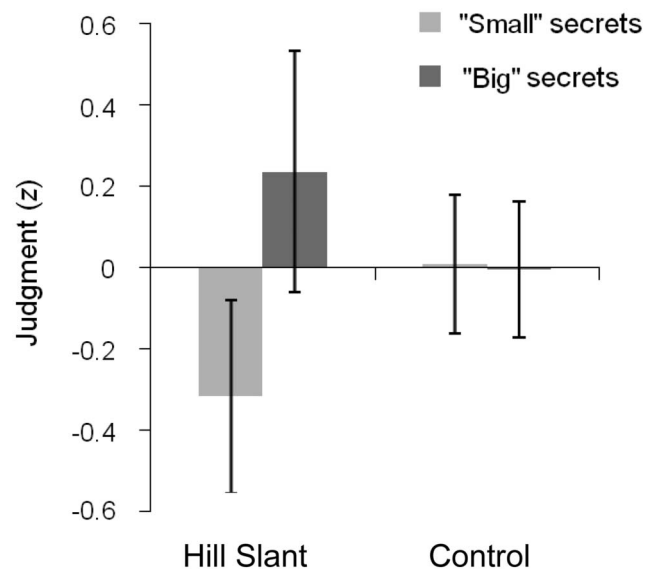


Figure 2. Standardized means of hill slant and control numerical judgments as a function of recalling “small” and “big” secrets in Study 2. Error bars denote 95% Confidence Intervals of the Mean.

below this threshold ($p = .005$) as does the p value for the relationship between preoccupation and judgments of hill slant ($p < .0001$). In contrast, the parallel p values for control numerical judgments do not fall below the more stringent $\alpha = .025$ threshold ($p = .91$, and $p = .08$, respectively).

Discussion

Comparing Study 2 to the original Slepian and colleagues (2012) work, we found evidence for replicability at both the operationalization level and the phenomenon level. That is, both the original variable (recalling “big” vs. “small” secrets) as well as the new secrecy variable (how preoccupied one was by the secret) predicted hill slant judgments.

Thus in both Studies 1 and 2, the *preoccupation* measure of secrecy predicted hill slant judgments, whereas only in Study 2 did the recall of “big” and “small” secrets predict hill slant judgments. To examine the reliability of each relationship, we conducted a meta-analysis of the two studies, following procedures outlined in Rosenthal (1991) for combining effect sizes. This analysis revealed an overall effect size of $r = .07$ for the effect of recalling “big” and “small” secrets upon judgments of hill slant, with an associated p value of $p = .37$.

The overall effect size for the relationship between preoccupation with one’s secret and judgments of hill slant was $r = .38$, with an associated p value of $p < .001$. The preoccupation relationship (but not the “big” vs. “small” manipulation) is significant at below the $\alpha = .025$ threshold that might be reasonably adopted to answer the criticism that including both measures gives two opportunities to find a significant effect.

The failure of recalling “big” versus “small” secrets to produce a consistent effect upon judgments of hill slant is consistent with the notion that secret “size” is an imprecise manipulation of the subjective importance of a secret. Secrets categorized as “big” could, on average, tend to weigh more heavily on the mind of the secret keeper than secrets categorized as “small,” just as big objects tend to weigh more than small objects. But these standard conventions should only matter to the extent that they correlate with a participant’s own subjective view of the secret (just as the size of objects only matters in determining their weight to the extent their size correlates with their mass). How preoccupied a participant is with their secret should determine whether it hampers their ability to navigate their external world, just as the weight of an object one must carry determines whether it hampers one’s movement in the external world. If this is the case, then we would expect a manipulation of subjective preoccupation to more reliably influence our dependent measure, judgments of hill slant.

Study 3

Preoccupation with a secret may be a more reliable indication of a secret’s gravity than whether the secret is conventionally treated as “big” or “small.” Indeed, in Studies 1 and 2, there was a reliable relationship between preoccupation with one’s secret and a variable that varies with physical burden, judgments of hill slant. However, the link between preoccupation and burden-consistent outcomes has thus far been correlational, and so whether preoccupation with secrets can induce burden-consistent outcomes remains an open question. Study 3, therefore, examined whether a

manipulation of the recall of preoccupying versus nonpreoccupying secrets would produce differences in judgments of hill slant, thereby suggesting a causal link between preoccupation with secrets and burdensomeness.

Study 3 also had a second goal, which was to seek a better understanding of the mechanisms of the burdens of secrecy. Replication attempts are most informative when they extend existing theory (see Cesario, 2014). Absent in prior work on the burdens of secrecy (Slepian et al., 2012; LeBel & Wilbur, 2014) has been theorizing behind how secrecy could influence burden-consistent outcomes. Following recent theory on the economy of action and perceptual judgments (Cole & Balci, 2013; Proffitt, 2006; Schnall et al., 2010), we suggest that the influence of secrecy on exaggerated perceptual judgments of the physical world (e.g., increased judgments of hill slant) should be interpreted as secrecy leading to judgments of the environment as more forbidding and extreme. That is, when preoccupied by a secret, one is devoting personal resources toward that secret. This increased preoccupation with the secret might suggest to the secret holder that increased effort is needed to keep the secret (and thus less effort is available for other pursuits). In other words, just as physical burdens lead to more extreme judgments of the external environment by increasing the effort required to interact with it (Cole & Balci, 2013; Eves, 2014; Proffitt, 2006; Schnall et al., 2010; Witt et al., 2004), perhaps so does preoccupation with secrets.

We hypothesized that increased effort needed to keep a secret mediates the link between preoccupations with one’s secret and judgments of the environment as more forbidding and extreme. Specifically, we predict that preoccupying secrets (relative to nonpreoccupying secrets) will be judged as more effortful to keep, which will predict judgments of the environment as more forbidding (i.e., a hill as more steep).

Method

As with the prior studies, this study was preregistered on the Open Science Framework.³ Thus, the methods, procedure, sample size, and analysis plan, including rules for data exclusions, were all committed to in advance of data collection. These predetermined details were identical to Studies 1 and 2, with the exception of a change in the manipulation, and the addition of the new effort measure to explore a potential mediator of the burdens of secrecy. In place of being asked to recall “big” or “small” personal secrets participants were now asked (by random assignment) to recall a secret that met a set of criteria. In the preoccupied condition, participants were asked to recall a secret that met each of three criteria: a) “You think about it reasonably often,” b) “It really affects you,” and c) “It really bothers you.” In the nonpreoccupied condition the criteria were a) “You almost never think about it,” b) “It doesn’t really affect you,” and c) “You feel okay about it.” As is standard, between this manipulation and the dependent measures (from the prior studies), we measured the proposed mediator by asking, “How much effort does it take for you to keep your secret?” from 1-*not at all effortful* to 9-*extremely effortful*. Participants ($N = 100$, $M_{\text{age}} = 34.84$ years, 62% female) then rated the same dependent measures as in Studies 1 and 2. Lastly, as a

³ Retrieved from https://osf.io/ntwg/?view_only=8484617c288a422bb89e20eb2f8850a2

manipulation check, we measured how preoccupied participants were by their recalled secret, utilizing the same measure from the prior studies.

Results

Two participants in the nonpreoccupied secret condition, and one participant in the preoccupied secret condition, indicated that they did not have a secret that fit the prompt, and these participants were therefore excluded. The predetermined analysis plan was identical to Study 1: conducting a 2 (condition) \times 2 (judgment type) ANOVA as well as parallel analyses that examined whether the effort measure predicted hill slant judgments, and control judgments. We first confirm, however, whether the new manipulation was successful as measured by the final manipulation check.

Manipulation check. We compared participants' responses on the preoccupation measure ($\alpha = .94$), measured last as a manipulation check. Participants asked to recall preoccupying secrets indeed indicated being more preoccupied by those secrets ($M = 4.94$, $SD = 1.79$) than participants asked to recall nonpreoccupying secrets ($M = 2.23$, $SD = 1.44$), $t(92.87) = 8.24$, $p < .0001$, $r = .64$.⁴

Preoccupying versus nonpreoccupying secrets. As in the prior studies, the 2 (condition: preoccupied, nonpreoccupied) \times 2 (judgment type: hill slant, control estimates) ANOVA was conducted on standardized measures of hill slant and the control numerical estimation index (for ease of interpretation, untransformed slant estimates are presented in text; see Figure 3 for standardized means). This analysis revealed no main effect of condition ($n_{preoccupied} = 50$, $n_{nonpreoccupied} = 47$), $F(1, 95) = 1.64$, $p = .20$, $\eta^2 = .02$, and no main effect of judgment-type, $F(1, 95) = 0.01$, $p = .94$, $\eta^2 < .01$. There was, however, a significant interaction, $F(1, 95) = 6.60$, $p = .01$, $\eta^2 = .06$.

To examine the nature of this interaction, follow-up tests examined the influence of condition on each variable. Asking participants to recall preoccupying secrets led them to judge hill slant as steeper ($M = 46.24^\circ$, $SD = 14.94$) than asking participants to recall nonpreoccupying secrets ($M = 38.63^\circ$, $SD = 17.17$), $t(95) = 2.33$, $p = .02$, $r = .23$. There was no difference, however, in the control numerical estimation index ($M_{preoccupied} = -.076$, $SD =$

$.707$; $M_{nonpreoccupied} = .081$, $SD = .622$), $t(95) = 1.15$, $p = .25$, $r = .12$.

Effort. Regressions were conducted to examine whether the new effort measure predicted hill slant judgments, and the control numerical estimation index. Increased effort judged to keep the secret predicted increased judgments of hill slant, $b = 1.71$, $t(95) = 2.36$, $p = .02$, but did not predict the control numerical estimation index, $b = -.02$, $t(95) = -0.65$, $p = .52$.

Indirect effect of preoccupation on judgments of hill slant through effort. Consistent with recent theory on the economy of action and perceptual judgments, which demonstrates that physical burdens lead to more extreme judgments of the external environment by increasing the effort required to interact with it (Cole & Balcetis, 2013; Eves, 2014; Proffitt, 2006; Schnall et al., 2010; Witt et al., 2004), we predicted that judged effort needed to keep the secret might mediate the influence of recalling preoccupying (vs. nonpreoccupying) secrets upon judgments of hill slant. We used a bootstrapping technique to estimate the indirect effect of the preoccupation manipulation on judgments of hill slant through judgments of effort needed to keep the secret (Hayes, 2009; Preacher & Hayes, 2004). This technique generates an empirical representation of the distribution of the sample by repeatedly resampling it with replacement, producing 5,000 estimates of the indirect effect. The size of the indirect effect is estimated by examining the 95% bias-corrected and accelerated bootstrap confidence interval of these estimates (which corrects for any bias or skew in the distribution; Hayes, 2009). This produces a confidence interval of the indirect path from the preoccupation manipulation to increased judgments of hill slant, through increased judgments of effort needed to keep the secret.

The 95% confidence interval (CI) for the predicted indirect unstandardized path coefficient ($M = 2.0319$, $SE = 1.4904$) ranged from .0423 to 6.1586, which as it does not include zero, demonstrates a significant indirect pathway, wherein preoccupation predicted increased judgments of hill slant through increased judged effort to keep the secret. The same mediation model with the control numerical estimation index as the dependent variable ($M = -.0132$, $SE = .0488$) did not produce a significant indirect path (-.1184, .0823), indicating that the results were specific to judgments of hill slant.

Discussion

A manipulation that asked participants to recall preoccupying versus nonpreoccupying secrets produced differences in judgments of hill slant. We propose that the success of this manipulation (relative to the "big" vs. "small" manipulation) speaks to the mechanisms of the burdens of secrecy. That is, it is important to separate phenomenon-based hypotheses from specific study methodology in evaluating replication attempts. For example, Slepian and colleagues (2012) proposed that consistent with language used to describe secrets (e.g., being "burdened" or "weighed" down), secrecy processes might lead to judgment outcomes that vary with physical burden, suggesting that the psychological burden from

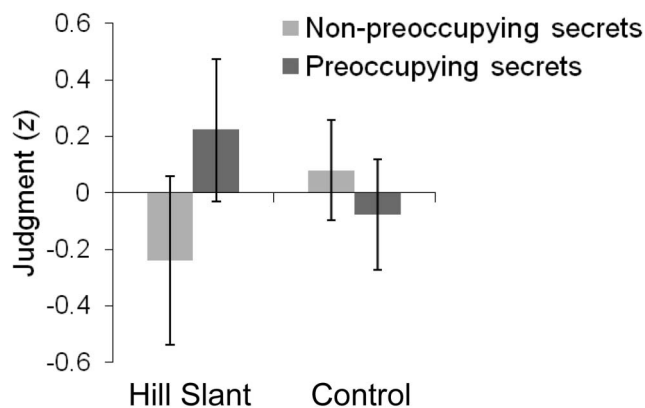


Figure 3. Standardized means of hill slant and control numerical judgments as a function of recalling preoccupying and nonpreoccupying secrets in Study 3. Error bars denote 95% Confidence Intervals of the Mean.

⁴ Levene's Test for Equality of Variances, $F = 3.97$, $p = .05$, revealed that variances significantly differed, and thus a correction factor was used, which does not alter the significance of the results (without the correction factor: $t(95) = 8.18$, $p < .0001$).

secrecy could lead to outcomes similar to physical burden (indeed, a wealth of evidence supports a tight coupling between such mental and physical depletion, as well as a coupling between mental and physical effort; Baumeister, Muraven, & Tice, 2000; Preston & Wegner, 2009).

One method used to test secrecy-burden hypothesis was asking participants to recall “big” versus “small” personal secrets, relying upon the assumption that secrets recalled in the former condition should be more psychologically burdensome than those recalled in the latter condition. However, the veracity of that assumption rests upon participants recalling secrets that are more or less psychologically burdensome in their respective conditions. They might sometimes, however, recall secrets that fit conventions of “big” or “small,” without actually recalling secrets that are personally influential, or uninfluential, respectively.

Instead, a more precise manipulation of asking for influential or uninfluential secrets might serve to better manipulate the phenomenon of interest. Indeed, initial evidence supports this hypothesis. Recall that in Study 3, participants in the preoccupied condition recalled more preoccupying secrets than those in the nonpreoccupied condition [$t(92.87) = 8.24, p < .0001$]. If recalling “big” and “small” secrets consistently produces similar effects (i.e., recalling *personally* influential and noninfluential secrets, respectively), then participants should consistently differ with respect to the measure of preoccupation. While in the expected direction, they did not significantly differ on this measure, however [Study 1: $M_{\text{“big”}} = 4.14, SD = 1.70$; $M_{\text{“small”}} = 3.75, SD = 1.84, t(96) = 1.11, p = .27$; Study 2: $M_{\text{“big”}} = 4.16, SD = 1.95$; $M_{\text{“small”}} = 3.76, SD = 1.80, t(95) = 1.05, p = .30$], suggesting perhaps some participants are recalling influential and noninfluential secrets, respectively, but not all. Thus it seems that the “big” versus “small” secret recall manipulation only weakly correlates with a measure of how personally influential a secret is to the secret keeper, and thus might only sometimes produce downstream burden outcomes.

The new successful secret preoccupation manipulation (based upon the reliable relationship found between measured preoccupation and judgments of hill slant in Studies 1 and 2) also suggested the measurement of a potential mediator to the burdens of secrecy, that of judged effort to keep the secret. That is, prior work examining mechanisms of the influence of physical burden on perceptual judgments demonstrates a key role for effort. One way in which the experience of physical burden leads to judgments of the environment as forbidding or extreme is through increased effort judged to interact with external environment while retaining the physical burden (Cole & Balcetis, 2013; Eves, 2014; Proffitt, 2006; Schnall et al., 2010; Witt et al., 2004; but see Woods, Philbeck, & Danoff, 2009). In other words, physical burden compromises one’s ability to interact with external environment, which leads the environment to be judged as requiring more effort to manage, which thereby leads the environment to seem more forbidding. Indeed, we found evidence that effort judged to keep a secret played a similar meditational role for secrecy.

One possibility is that effort does not serve this meditational role, but rather is redundant with how preoccupied participants are with their secret. Although a regression reveals that preoccupation with secrets (as measured by the manipulation check) and judged effort to keep secrets are related to one another, $b = .61, p < .001$, the R^2 for this regression reveals that the preoccupation measure

(i.e., the manipulation check) explains only 32% of the variance of judged effort to keep the secret. It should be noted that measurement of the effort mediator can only reveal statistical mediation. That is, we can only infer, not demonstrate, a causal role for this mediator. That said, asking specifically for how much effort participants judge as needed to conceal their secret brings the advantage of measuring a variable explicitly linked to burden-consistent outcomes in previous work (Cole & Balcetis, 2013; Eves, 2014; Proffitt, 2006; Schnall et al., 2010; Witt et al., 2004). Moreover, judged effort needed to keep a secret is theoretically distinct from how much one is preoccupied by that secret (e.g., we argue that it is easy to imagine a secret that is easy to keep, but preoccupying nonetheless).

Consistent with the resource-based theory of perceptual judgments, we propose that one way in which secrecy might lead to judgments of the environment as forbidding or extreme is through increased effort judged to interact with external environment while retaining the secret. Given the novelty of this prediction, we sought to examine whether this meditational pathway would replicate, conducting an exact replication of Study 3.

Study 4

Given that Study 3 presents a new paradigm to manipulate the burdens of secrecy, it is important to examine the replicability of the new manipulation, as well as the meditational pathway found in Study 3. We thus conducted an exact replication of Study 3, and examined whether the new manipulation would again influence judgments of hill slant. Critically, we also tested whether the manipulation influenced judgments of effort to keep the secret, and if the meditational pathway found in Study 3 replicated. This latter meditational path begins to suggest a mechanism behind the burdens of secrecy, and thus is particularly important to examine.

Method

Study 4 employed the same procedure as Study 3. To determine a sample size for this replication study, we calculated the sample size needed to find an effect size of $r = .15$ (equivalent to Cohen’s $d = .30$). We chose this effect size because we considered it be the smallest effect size we considered meaningful and practical for the current context (see Fritz, Morris, & Richler, 2012); one that is small-to-medium, slightly on the smaller size according to standard conventions (small: $r = .10, d = .20$; medium: $r = .30, d = .50$). As our results suggest thus far, secrecy processes can be difficult to manipulate and measure. Thus, we propose that even a small effect size could be considered meaningful, which is why the chosen effect size is on the smaller end of the small-to-medium continuum, but not so small as to be practically difficult to uncover. An a priori sample size calculator for an independent samples t test determined that a sample size of 352 participants would be needed to find such an effect size (entering $d = .30$, power = .80, $\alpha = .05$; Soper, 2014), and thus we recruited this number of participants ($N = 352, M_{\text{age}} = 31.92$ years, 55% male).

Results

Sixteen participants indicated not having a secret that fit the prompt (preoccupying secret $n = 11$, nonpreoccupying secret $n =$

5), and one participant indicated the hill was 90° steep. As in the earlier studies, these participants were excluded. Study 4's results paralleled those of Study 3. The manipulation check was successful, whereby participants indicated being more preoccupied by preoccupying secrets ($M = 4.96, SD = 1.47$) than by nonpreoccupying secrets ($M = 2.32, SD = 1.10$), $t(325.44) = 19.39, p < .001, r = .73$.⁵

Recalling preoccupying secrets led to steeper judgments of hill slant ($M = 43.11^\circ; SD = 17.07$) than did recalling nonpreoccupying secrets ($M = 39.62^\circ; SD = 14.81$), $t(332.995) = 2.001, p = .046, r = .11$.⁶ Additionally, the former group judged more effort was needed to keep their secret ($M = 4.49, SD = 2.37$) than did the latter group ($M = 2.74, SD = 1.85$), $t(329.20) = 7.43, p < .001, r = .38$.⁷ Judged effort needed to keep the secret predicted judgments of hill slant, $b = 1.14, t(333) = 3.01, p = .003$.

Given this pattern of findings, we again examined the proposed meditational pathway using the bootstrapping technique from Study 3. First, the proposed mediator, effort, seemed distinct to preoccupation (as measured by the manipulation check). That is, while the two were related to each other, $b = .74, p < .001$, preoccupation only explained 37% of the variance of judged effort needed to keep the secret, giving us confidence that a) these theoretically distinct constructs were b) not too highly interrelated to test our proposed meditational analysis.

Again, recalling preoccupying (vs. nonpreoccupying) secrets increased judgments of hill slant, through increased judgments of effort needed to keep the secret ($M = 1.7347, SE = .7489$), 95% CI (.4706, 3.4452). Critically, a parallel mediation analysis with the control numerical estimation index [$M = .0152, SE = .0277$], 95% CI (-.0374, .0744)] revealed that these effects were specific to judgments of hill slant.

Discussion

These results demonstrate that, as in Study 3, recalling preoccupying (vs. nonpreoccupying) secrets increased judgments of hill slant, mediated by increased judgments of effort needed to keep the secret. This pattern of results is consistent with the hypothesis that by preoccupying one's resources, a secret seems to require more effort to keep. By requiring more effort to keep the secret, less effort should be available for other pursuits, which is known to lead to more extreme judgments of the environment (Cole & Balcetis, 2013; Eves, 2014; Proffitt, 2006; Schnall et al., 2010; Witt et al., 2004).

General Discussion

The hypothesis of secrecy processes influencing burden-consistent outcomes promises integrative insights across a number of psychological disciplines (social, cognitive, perceptual and health psychology) by speaking to disparate areas of study (e.g., judgments of physical space, social cognition, coping with secrecy). Yet to examine these intersections, the mechanisms and reliability of such effects need to be examined, and this was the goal of the current work.

The current work demonstrates that secrecy reliably leads to burden-consistent outcomes, but that this process is based in internal, subjective experiences of preoccupation, that is, how personally influential or weighty the secret is (rather than external,

standard conventions of a secret's "size"). Measurement or manipulation of preoccupation with one's recalled secret is reliably related to judgments of hill slant, and this relationship is mediated by judgments of effort needed to keep the secret.

The current work examined the mechanisms of the burdens of secrecy as well as the replicability of the burdens of secrecy at two different levels, the operationalization level, and the phenomenon level. The current findings suggest that one methodology does not reliably produce burden-consistent effects, whereas across each study, evidence was found for the burdens of secrecy with a different operationalization. A meta-analysis of the first two studies demonstrated that the manipulation of asking participants to recall "big" versus "small" secrets did not reliably produce differences in judgments of hill slant, but still a measure of how preoccupied participants were with their recalled secret did reliably predict hill slant judgments (even when dividing the alpha-level used to assess significance across the two tests, thereby requiring each test to meet the criterion of $\alpha = .025$ to be considered significant).

Studies 3 and 4 then revealed that it is not that secrecy manipulations or dichotomous variables, in general, fail to influence burden outcomes, but rather that the particular manipulation used in Studies 1 and 2 might not be well suited to examining the burdens of secrecy. Participants asked to recall "big" or "small" personal secrets might sometimes produce secrets that seem "big" or "small" according to standard conventions regardless of how influential those secrets are at a personal level. For example, a person who has come to feel accepting of a prior infidelity may nevertheless consider it to be a "big" secret because infidelity is generally treated as such. Therefore, a manipulation that assigns participants to recall "big" or "small" personal secrets may be a rather imprecise manipulation for inducing burdening and nonburdening secrets, respectively. Indeed, a recent paper (LeBel & Wilbur, 2014) documents two failures of a manipulation that asks participants to recall "big," relative to "small," personal secrets on judgments of hill slant, as does one study (of two studies) in the current work. These study failures contribute an important advancement to the study of the burdens of secrecy, by helping advance the notion that a manipulation of secret "size" is too imprecise.

That is, such study failures may be due in part to an overreliance on asking for differently "sized" secrets (wherein participants were not told what is meant by a "big" or "small" secret). Given the demonstrated ambiguity of these terms, participants may have recalled secrets based on criteria that only weakly corresponded with self-perceived personal importance, thereby yielding a rather imprecise manipulation as the critical variable with which to predict experiences of burden (initial evidence supports this hypothesis; see discussion of preoccupation in Study 3's Discus-

⁵ Levene's Test, $F = 15.36, p < .001$, revealed that variances significantly differed; a correction factor was used that did not alter the significance of the results (without correction factor: $t(333) = 19.01, p < .0001$).

⁶ Levene's Test, $F = 4.49, p = .035$, revealed that variances significantly differed; a correction factor was used that did not alter the significance of the results (without correction factor: $t(333) = 1.98, p = .048$).

⁷ Levene's Test, $F = 24.07, p < .001$, revealed that variances significantly differed; a correction factor was used that did not alter the significance of the results (without correction factor: $t(333) = 7.43, p < .001$).

sion). Instead, Studies 1 and 2 found that how preoccupied participants were with their secret positively predicted judgments of hill slant, consistent with the burdens of secrecy hypothesis. Importantly, Studies 3 and 4 also demonstrated this process experimentally, whereby those asked to recall preoccupying secrets, versus nonpreoccupying secrets, judged hill slant to be steeper.

Moreover, the present studies suggested a mechanism by which consequential secrets lead to burden-consistent judgments: increased effort needed to keep the secret. The current work suggests that, just as physical burdens lead to more extreme judgments of the external environment by increasing the effort required to interact with it (Cole & Balcetis, 2013; Eves, 2014; Proffitt, 2006; Schnall et al., 2010; Witt et al., 2004), so too do secrets.

Beyond both providing clarification for a mechanism behind the burdens of secrecy, and the replicability of the influence of recalling secrets on judgments of hill slant at both the operationalization and phenomenon levels, the current work offers implications for secrecy more broadly. The demonstration of the importance of how preoccupied one is by a secret points toward potential avenues for intervention, with potential improvement for health. Without others to discuss the secret with, one only has the option to internally ruminate upon the secret (or attempt to suppress thoughts of the secret, which could also lead to rumination; Lane & Wegner, 1995). Increased preoccupation with one's own secret is indeed associated with decreased well-being (Maas, Wismeijer, van Assen, & Aquarius, 2012), suggesting one possible negative health consequence for the burdens of secrecy.

Recent work suggests that one way to relieve the burdens of secrecy is simply to reveal the secret (Slepian, Masicampo, & Ambady, 2014). In that work, participants revealed (or merely thought about) secrets anonymously over the Internet. Thinking about secrets led to increased judgments of hill slant and distance, relative to a control condition where no mention was made of secrets. Explicitly revealing secrets anonymously over the Internet, in contrast, led to judgments that were no different from the control condition. Thus, revealing secrets, at least temporarily, in an anonymous environment can lift the burden. In those studies, participants were asked to recall, or reveal, "big" secrets (but there was no "small" secrets comparison). Perhaps the methods in those studies could also be improved, with consequent improvement in participants' coping. Given that being asked to recall a "big" secret might not consistently lead to recalling secrets that are most personally influential to participants, then being asked instead to reveal a preoccupying secret might lift the burden even more than being asked to reveal a "big" secret.

It is important to note that revealing secrets to people (nonanonymously) could prove even more beneficial if those others are accepting. Revealing secrets to the wrong person, however, could do more harm than good (by increasing distress; Kelly & Yip, 2006; Rodriguez & Kelly, 2006). Thus when revealing a secret is not an option, targeting preoccupation with one's secret could prove to be a beneficial intervention to the burdens of secrecy. Expressive writing about personal trauma has been shown to have positive benefits for physical and psychological health, through giving individuals enhanced insights into those traumas (Pennebaker, 1989; Smyth, 1998). Perhaps an intervention such as this can also have positive benefits for secrecy by reducing preoccupation with one's secret and thereby reducing the burdens of secrecy.

Finally, Studies 3 and 4 linked consequences of psychological processes upon sensorimotor processes, through action-regulation mechanisms. That is, we linked these two processes by drawing upon an established mechanism of influence, here, the role of effort (for a distinct but related account between mental and physical effort, see Preston & Wegner, 2009). By framing the influence of having a personally influential and meaningful secret as a process by which one can become preoccupied by that secret, we identified a possible mechanism of influence through which such preoccupation could lead to burden-consistent outcomes. Indeed, in both Studies 3 and 4, manipulating the recall of preoccupying (vs. nonpreoccupying) secrets increased judgments of hill slant, mediated by increased judgments of effort needed to keep the secret, consistent with the notion that psychological processes that make interacting with the environment more difficult and effortful lead the environment to be judged as more forbidding and extreme (Cole & Balcetis, 2013; Eves, 2014; Proffitt, 2006; Schnall et al., 2010; Witt et al., 2004).

The current work demonstrates that measurement and manipulation of the recall of preoccupying secrets reliably influences judgments of hill slant, whereas the underspecified manipulation of recalling different "sizes" of secrets does not. Additionally, recalling preoccupying secrets, relative to nonpreoccupying secrets, increased judgments of hill slant, mediated by increased judgments of effort needed to keep the secret, suggesting a potential mechanism for the burdens of secrecy. In sum, the current work helps illuminate how secrecy can prove burdensome, and suggests potential points of intervention to relieve such burden.

References

- Baumeister, R. F., Muraven, M., & Tice, D. M. (2000). Ego depletion: A resource model of volition, self-regulation, and controlled processing. *Social Cognition, 18*, 130–150.
- Brandt, M. J., IJzerman, H., Dijksterhuis, A., Farach, F. J., Geller, J., Giner-Sorolla, R., . . . Van't Veer, A. (2014). The replication recipe: What makes for a convincing replication? *Journal of Experimental Social Psychology, 50*, 217–224.
- Cesario, J. (2014). Priming, replication, and the hardest science. *Perspectives on Psychological Science, 9*, 40–48. <http://dx.doi.org/10.1177/1745691613513470>
- Cole, S., & Balcetis, E. (2013). Sources of resources: Bioenergetic and psychoenergetic resources influence distance perception. *Social Cognition, 31*, 721–732. <http://dx.doi.org/10.1521/soco.2013.31.6.721>
- Cole, S. W., Kemeny, M. E., Taylor, S. E., & Visscher, B. R. (1996). Elevated physical health risk among gay men who conceal their homosexual identity. *Health Psychology, 15*, 243–251. <http://dx.doi.org/10.1037/0278-6133.15.4.243>
- Cole, S. W., Kemeny, M. E., Taylor, S. E., Visscher, B. R., & Fahey, J. L. (1996). Accelerated course of human immunodeficiency virus infection in gay men who conceal their homosexual identity. *Psychosomatic Medicine, 58*, 219–231. <http://dx.doi.org/10.1097/00006842-199605000-00005>
- Critcher, C. R., & Ferguson, M. J. (2014). The cost of keeping it hidden: Decomposing concealment reveals what makes it depleting. *Journal of Experimental Psychology: General, 143*, 721–735. <http://dx.doi.org/10.1037/a0033468>
- Day, M. V., & Bobocel, D. R. (2013). The weight of a guilty conscience: Subjective body weight as an embodiment of guilt. *PLoS ONE, 8*(7), e69546. <http://dx.doi.org/10.1371/journal.pone.0069546>
- Durgin, F. H., Baird, J. A., Greenburg, M., Russell, R., Shaughnessy, K., & Waymouth, S. (2009). Who is being deceived? The experimental

- demands of wearing a backpack. *Psychonomic Bulletin & Review*, *16*, 964–969. <http://dx.doi.org/10.3758/PBR.16.5.964>
- Durgin, F. H., Klein, B., Spiegel, A., Strawser, C. J., & Williams, M. (2012). The social psychology of perception experiments: Hills, backpacks, glucose, and the problem of generalizability. *Journal of Experimental Psychology: Human Perception and Performance*, *38*, 1582–1595. <http://dx.doi.org/10.1037/a0027805>
- Eves, F. F. (2014). Is there any Proffitt in stair climbing? A headcount of studies testing for demographic differences in choice of stairs. *Psychonomic Bulletin & Review*, *21*, 71–77. <http://dx.doi.org/10.3758/s13423-013-0463-7>
- Firestone, C. (2013). How “paternalistic” is spatial perception? Why wearing a heavy backpack doesn’t—And couldn’t—make hills look steeper. *Perspectives on Psychological Science*, *8*, 455–473. <http://dx.doi.org/10.1177/1745691613489837>
- Frijns, T., & Finkenauer, C. (2009). Longitudinal associations between keeping a secret and psychosocial adjustment in adolescence. *International Journal of Behavioral Development*, *33*, 145–154. <http://dx.doi.org/10.1177/0165025408098020>
- Fritz, C. O., Morris, P. E., & Richler, J. J. (2012). Effect size estimates: Current use, calculations, and interpretation. *Journal of Experimental Psychology: General*, *141*, 2–18. <http://dx.doi.org/10.1037/a0024338>
- Hayes, A. F. (2009). Beyond Baron and Kenny: Statistical mediation analysis in the new millennium. *Communication Monographs*, *76*, 408–420. <http://dx.doi.org/10.1080/03637750903310360>
- Kelly, A. E., & Yip, J. J. (2006). Is keeping a secret or being a secretive person linked to psychological symptoms? *Journal of Personality*, *74*, 1349–1370. <http://dx.doi.org/10.1111/j.1467-6494.2006.00413.x>
- Kouchaki, M., Gino, F., & Jami, A. (2014). The burden of guilt: Heavy backpacks, light snacks, and enhanced morality. *Journal of Experimental Psychology: General*, *143*, 414–424. <http://dx.doi.org/10.1037/a0031769>
- Lane, J. D., & Wegner, D. M. (1995). The cognitive consequences of secrecy. *Journal of Personality and Social Psychology*, *69*, 237–253. <http://dx.doi.org/10.1037/0022-3514.69.2.237>
- LeBel, E. P., & Wilbur, C. J. (2014). Big secrets do not necessarily cause hills to appear steeper. *Psychonomic Bulletin & Review*, *21*, 696–700. <http://dx.doi.org/10.3758/s13423-013-0549-2>
- Lee, E. H., & Schnall, S. (2014). The influence of social power on weight perception. *Journal of Experimental Psychology: General*, *143*, 1719–1725.
- Maas, J., Wismeijer, A. A. J., van Assen, M. A. L. M., & Aquarius, A. E. A. M. (2012). Is it bad to have secrets? Cognitive preoccupation as a toxic element of secrecy. *International Journal of Clinical and Health Psychology*, *12*, 23–37.
- Oishi, S., Schiller, J., & Gross, E. B. (2013). Felt understanding and misunderstanding affect the perception of pain, slant, and distance. *Social Psychological and Personality Science*, *4*, 259–266.
- Pennebaker, J. W. (1989). Confession, inhibition, and disease. In L. Berkowitz (Ed.), *Advances in experimental social psychology* (Vol. 22, pp. 211–244). New York, NY: Academic Press.
- Preacher, K. J., & Hayes, A. F. (2004). SPSS and SAS procedures for estimating indirect effects in simple mediation models. *Behavior Research Methods, Instruments, & Computers*, *36*, 717–731. <http://dx.doi.org/10.3758/BF03206553>
- Preston, J., & Wegner, D. M. (2009). Elbow grease: When action feels like work. In E. Morsella, J. A. Bargh, & P. M. Gollwitzer (Eds.), *Oxford handbook of human action* (pp. 569–586). New York, NY: Oxford University Press.
- Proffitt, D. R. (2006). Embodied perception and the economy of action. *Perspectives on Psychological Science*, *1*, 110–122. <http://dx.doi.org/10.1111/j.1745-6916.2006.00008.x>
- Proffitt, D. R. (2009). Affordances matter in geographical slant perception. *Psychonomic Bulletin and Review*, *16*, 970–972. <http://dx.doi.org/10.3758/PBR.16.5.970>
- Proffitt, D. R. (2013). An embodied approach to perception: By what units are visual perceptions scaled? *Perspectives on Psychological Science*, *8*, 474–483. <http://dx.doi.org/10.1177/1745691613489837>
- Quinn, D. M., & Chaudoir, S. R. (2009). Living with a concealable stigmatized identity: The impact of anticipated stigma, centrality, salience, and cultural stigma on psychological distress and health. *Journal of Personality and Social Psychology*, *97*, 634–651. <http://dx.doi.org/10.1037/a0015815>
- Rodriguez, R. R., & Kelly, A. E. (2006). Health effects of disclosing personal secrets to imagined accepting versus non-accepting confidants. *Journal of Social and Clinical Psychology*, *25*, 1023–1047. <http://dx.doi.org/10.1521/jscp.2006.25.9.1023>
- Rosenthal, R. (1991). *Meta-analytic procedures for social research*. Newbury Park, CA: Sage.
- Schnall, S., Harber, K. D., Stefanucci, J. K., & Proffitt, D. R. (2008). Social support and the perception of geographical slant. *Journal of Experimental Social Psychology*, *44*, 1246–1255.
- Schnall, S., Zadra, J. R., & Proffitt, D. R. (2010). Direct evidence for the economy of action: Glucose and the perception of geographical slant. *Perception*, *39*, 464–482. <http://dx.doi.org/10.1068/p6445>
- Shea, L., & Masicampo, E. J. (2014). Self-affirmation counteracts the effects of burdens on judgments of distance. *Journal of Experimental Social Psychology*, *50*, 105–108.
- Simmons, J. P., Nelson, L. D., & Simonsohn, U. (2012). A 21 word solution. Retrieved from SSRN: <http://ssrn.com/abstract=2160588>
- Simonsohn, U. (2013). *Evaluating replication results*. Retrieved from SSRN: <http://ssrn.com/abstract=2259879>. <http://dx.doi.org/10.2139/ssrn.2259879>
- Slepian, M. L., Masicampo, E. J., & Ambady, N. (2014). Relieving the burdens of secrecy: Revealing secrets influences judgments of hill slant and distance. *Social Psychological & Personality Science*, *5*, 293–300. <http://dx.doi.org/10.1177/1948550613498516>
- Slepian, M. L., Masicampo, E. J., Toosi, N. R., & Ambady, N. (2012). The physical burdens of secrecy. *Journal of Experimental Psychology: General*, *141*, 619–624. <http://dx.doi.org/10.1037/a0027598>
- Smyth, J. M. (1998). Written emotional expression: Effect sizes, outcome types, and moderating variables. *Journal of Consulting and Clinical Psychology*, *66*, 174–184. <http://dx.doi.org/10.1037/0022-006X.66.1.174>
- Soper, D. S. (2014). A-priori sample size calculator for Student t-tests [Software]. Retrieved from <http://www.danielsoper.com/statcalc>
- Sugovic, M., & Witt, J. K. (2013). An older view on distance perception: Older adults perceive walkable extents as farther. *Experimental Brain Research*, *226*, 383–391. <http://dx.doi.org/10.1007/s00221-013-3447-y>
- Susewind, M., Christandl, F., & Hoelzl, E. (2013). Feel the moral weight on your shoulders: How material objects are experienced as heavier or lighter through moral meaning. In M. Susewind (Eds.), *Subjective morality: Empirical studies on how people balance their own interests with the interests of others and experience moral meaning*. (Unpublished doctoral dissertation). University of Cologne, Cologne, Germany.
- Vangelisti, A. (1994). Family secrets: Forms, functions, and correlates. *Journal of Social and Personal Relationships*, *11*, 113–135. <http://dx.doi.org/10.1177/0265407594111007>
- Witt, J. K. (2011). Action’s effect on perception. *Current Directions in Psychological Science*, *20*, 201–206. <http://dx.doi.org/10.1177/0963721411408770>
- Witt, J. K., Linkenauger, S. A., Bakdash, J. Z., Augustyn, J. S., Cook, A., & Proffitt, D. R. (2009). The long road of pain: Chronic pain increases perceived distance. *Experimental Brain Research*, *192*, 145–148. <http://dx.doi.org/10.1007/s00221-008-1594-3>

- Witt, J. K., Proffitt, D. R., & Epstein, W. (2004). Perceiving distance: A role of effort and intent. *Perception, 33*, 577–590. <http://dx.doi.org/10.1068/p5090>
- Witt, J. K., & Sugovic, M. (2013). Response bias cannot explain action-specific effects: Evidence from compliant and non-compliant participants. *Perception, 42*, 138–152. <http://dx.doi.org/10.1068/p7367>
- Woods, A. J., Philbeck, J. W., & Danoff, J. V. (2009). The various perceptions of distance: An alternative view of how effort affects distance judgments. *Journal of Experimental Psychology: Human Perception and Performance, 35*, 1104–1117. <http://dx.doi.org/10.1037/a0013622>
- Zheng, M., Fehr, R., Tai, K., Narayanan, J., & Gelfand, M. (2014). The unburdening effects of forgiveness: Effects on slant perception and jumping height. *Social Psychological and Personality Science*. Advance Online Publication. <http://dx.doi.org/10.1177/1948550614564222>

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