



## Holding a silver lining theory: When negative attributes heighten performance<sup>☆</sup>



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### HIGHLIGHTS

- Silver lining lay theories are prevalent and spontaneously generated.
- For people induced with impulsivity, a silver lining theory heightens creativity.
- Holding a silver lining theory increases effort invested in performance.

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### ABSTRACT

Holding a lay theory that a negative personal attribute is associated with a positive attribute (i.e., a silver lining theory), may increase effortful performance in the domain of the positive attribute. In Study 1, individuals readily generated personal silver lining theories when prompted to consider a negative attribute, and the majority of individuals endorsed them for themselves. In Studies 2 and 3, we investigated how believing in a silver lining theory affected performance using the specific silver lining theory that impulsivity was associated with creativity. In both a college (Study 2) and an online sample (Study 3), individuals induced to believe that they were impulsive and then given the specific silver lining theory that impulsivity was related to creativity showed greater effort-based creativity than those for whom the silver lining theory was refuted. In Study 4, individuals made to believe that they were impulsive and given the silver lining theory performed more creatively than those who received no information about a silver lining theory, indicating that the silver lining theory increased performance relative to baseline. Silver lining lay theories may allow people to compensate for a negative attribute by promoting effortful behavior in the domain of a positive attribute believed to be linked to that negative attribute.

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I am not strictly speaking mad, for my mind is absolutely normal in the intervals, and even more so than before. But during the attacks it is terrible—and then I lose consciousness of everything. But that spurs me on to work and to seriousness...

[Vincent van Gogh, Letter to Theo van Gogh, ca. 1889]

With only his right ear intact, Vincent van Gogh wrote his brother from an asylum to describe his attacks of “acute mania with generalized delirium” (Urpar, 1889). This account of his state of mind, however, was not entirely negative: van Gogh associated these attacks with his hard, creative work. Van Gogh arrived at a common-sense understanding

(i.e., lay theory) about the organization of his self, such that a negative attribute he possessed (i.e., suffering from attacks) was associated with a positive attribute he possessed (i.e., being a serious artist). While speculative, it seems possible that this silver lining theory helped van Gogh increase his creative output. In the present research, we test whether holding such a silver lining theory affects performance in the domain of the positive attribute.

### Lay theories

Our conceptualization of silver lining theories follows a long tradition of research on lay theories, which are common-sense based theories that people use to make sense of their self and surroundings (Dweck, 1999; Heider, 1958; Wegener & Petty, 1998). People hold theories about seemingly everything, including genetics (Plaks, Malahy, Sedlins, & Shoda, 2012), global warming (Dunlap, 1998), and obesity (McFerran & Mukhopadhyay, 2013). Some of these theories apply to people's own selves, including lay theories about willpower (Job,

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Walton, Bernecker, & Dweck, 2013; Miller et al., 2012), personality traits (Beer, 2002), and moods (Igou, 2004). Much research on lay theories about the self has focused on one specific type of lay theory, namely whether a personal attribute is malleable or fixed (implicit theories; Dweck & Leggett, 1988; Dweck, 2008). Silver lining theories are orthogonal to this work, and concern lay theories of the organization of personal attributes.

### Personal attributes

The self-concept (Baumeister, 1998; Forgas & Williams, 2002; Swann & Bosson, 2010) is comprised of a variety of self-aspects, which are each in turn comprised of attributes such as personality traits, group memberships, and behaviors (McConnell, 2011; McConnell, Shoda, & Skulborstad, 2012). Personal attributes vary both in content and valence (Alicke & Sedikides, 2009; North & Swann, 2008). Typically, individuals judge an attribute as negative or positive, i.e., perceive it as detrimental or conducive to their performance and well-being.

Various theories address the question of how personal attributes are organized. For example, Showers (1992) described how people organize attributes by valence, and McConnell (2011) focused on hierarchy. We depart from these lines of inquiry by considering how people believe personal attributes are organized.

### Silver lining theories

A silver lining theory is a form of lay theory in which a negative personal attribute is associated with a positive personal attribute. Impulsive individuals, for example, may hold a silver lining theory that their negative attribute of impulsivity is associated with their positive attribute of being creative. We hypothesize that individuals will readily endorse silver lining theories when prompted to think about a negative attribute they possess.

We also hypothesize that a silver lining theory increases effortful performance in the domain of the positive attribute implied by the silver lining theory—given that individuals believe that they possess the negative attribute. Belief in a silver lining theory may heighten both the value of performance and expectancies of success in the domain of the positive attribute. This should increase motivation, thereby increasing effort (Atkinson, 1957; Heckhausen, 1991). This increase in effortful performance provides compensation for possessing the negative attribute. For example, an impulsive individual who believes the silver lining theory that impulsivity is associated with creativity should exert more effort into behaving creatively than an impulsive individual who does not hold the silver lining theory.

In the present research, we explored the endorsement of silver lining theories generally by investigating whether lay individuals believe that for their own selves, a selected negative personal attribute is associated with a positive personal attribute (Study 1). We then examined whether inducing vs. refuting a silver lining theory in individuals who believed that they possessed the relevant negative attribute affected effort-based performance in the domain of the positive attribute (Studies 2 and 3). Finally, we analyzed to what extent inducing a silver lining theory increased effortful performance by adding a neutral control condition where participants received no information about a silver lining theory (Study 4).

#### Study 1: Prevalence of silver lining theories

We conducted a survey to examine if silver lining theories are pervasive and readily endorsed. We asked participants to describe one negative attribute they possessed, and asked if this attribute was or was not associated with a positive attribute. We expected that silver lining theories would be frequently endorsed.

## Method

### Participants and design

A total of 110 participants from Amazon's Mechanical Turk (see Buhrmester, Kwang, & Gosling, 2011) completed a brief survey for \$.10. Seven participants (6%) failed an attention check (i.e., responded to a question they were instructed to skip) and were excluded (see Mason & Suri, 2012). Exclusions based on failure to attend to stimuli in our online samples (Studies 1, 3, and 4) are comparable to rates found previously (e.g., Goodman, Cryder, & Cheema, 2012). The final sample of 103 participants (67 females) was  $M = 35.06$  ( $SD = 13.51$ ) years old.

### Procedure and materials

Measures were completed in the following order. Participants first brainstormed a negative personal attribute and wrote it down. They rated possession of the attribute (“To what extent do you have this trait,” and “How much is this trait a part of you”) on a scale from 1 (not at all) to 7 (very much). They rated the negativity of the attribute, first generally (“How negative do people in general consider this trait?”) and then personally (“How much does this trait interfere with your long-term and short-term goals?”). Belief in a silver lining theory was assessed by the item, “In you, to what extent do you think that this negative trait is connected to a positive trait” on a scale from 1 (not at all connected) to 7 (very connected). If participants indicated not at all connected, the survey ended. Otherwise, participants wrote down the positive attribute. They rated the extent to which they possessed this attribute, and the positivity of the attribute, again rating it generally (“How positive do people in general consider this trait?”) and personally (“How much does this trait help you with your long-term and short-term goals?”). Finally, they rated how weak or strong the association between their negative and positive attributes was on a scale from 1 (very weak) to 7 (very strong).

## Results and discussion

For both the negative and positive attributes, the two items assessing the extent to which participants possessed each attribute were highly correlated, so we averaged them for both the negative ( $\alpha = .74$ ) and positive ( $\alpha = .93$ ) attributes. Participants selected a negative attribute that was very much a part of them ( $M = 5.63$ ,  $SD = .99$ ), and negative both in general ( $M = 5.05$ ,  $SD = 1.35$ ) and for them personally ( $M = 4.81$ ,  $SD = 1.57$ ). Only ten participants (9.7%) indicated that their negative attribute was *not* associated with a positive attribute. Among the majority who held a silver lining theory, the positive attribute was very much a part of them ( $M = 5.89$ ,  $SD = 1.07$ ), and positive in general ( $M = 5.65$ ,  $SD = 1.04$ ) and for them personally ( $M = 5.63$ ,  $SD = 1.27$ ). Moreover, the association between the negative and the positive attribute was strong ( $M = 5.31$ ,  $SD = 1.24$ ).

The majority of individuals endorsed a silver lining theory: when prompted with a negative attribute, most participants readily generated a positive associated attribute. Participant-generated silver linings are presented in Table 1.<sup>1</sup> The present survey suggests that when given the opportunity, people endorse silver lining theories.

<sup>1</sup> Participants were not provided with examples of silver lining theories; they were allowed to interpret what a “trait” meant, and what “negative” and “positive” meant in regard to their own attributes. Perhaps because of this, some participant-generated silver lining theories appear to make little sense at face value. Whether this is due to participants misunderstanding the task, liberally interpreting instructions, or inadequately describing their silver lining theory in a way that makes sense to others, is hard to tell.

**Table 1**  
Participant generated silver linings (Study 1).

Attribute	
Negative	Positive
Act too often on gut instinct	Don't overthink meaningless things
Annoying	Helping
Anxiety	Overcoming fear
Anxious	None
Carelessness	Good-naturedness
Compulsive	Fun
Conceited	High self-esteem
Condescending	Modesty
Critical of self	Striving to achieve goals
Cynicism	Trusting/believing in other people
Depressed	Empathetic
Depressed	Practical
Depressed	Fun
Depressed	I don't stay depressed long
Emotional attachments	Honest love
Fear of failure	Drive to do well in everything
Fear of rejection	Carefulness
Fretfulness	Empathy
Honesty	Sincerity
I am far too over-analytical of everything	Rationality
I am physically unfit	None
I am quiet	Good listener
I don't speak up for myself	I don't say things without thinking
I don't think that I have anything positive to contribute	I work harder to make sure that I am contributing something to the greater good
I feel like a deformed person which everyone stares at	That I learned to walk with a walker and overcame the odds against me
I have a tendency to always look at the dark side of everything	None
I procrastinate too much	I like to have fun
I sometimes worry too much about minor things	Things are not as bad as they look
I tend to over question everyone	Caring
I worry a lot	Just being happy
I worry	I am confident
Impatient	Motivation
Impatient	Sense of urgency
Inability to make decisions	Wanting to please others
Inactivity	None
Indecisive	Ambition
Indecisive	Generosity
Insecure	Modesty
Insecure	Confidence
Intolerance with my stepson	Responsibility of helping my son grow up
Introverted	Independence
Irritable	Creativity
Irritable	Stubborn
Irritable	None
Irritation	motivation
Judgmental	Intuitive
Judgmental	None
Lack of emotions	Mental and emotional strength
Lack of self-confidence	None
Lazy	Aloofness
Lazy	Cautiousness
Lazy	Patient
Letting others make me feel I am to blame for their self-made mistakes	Knowing I am not to blame
Loner	Ability to focus
Low self esteem	None
Low self-esteem	Modesty
Melancholic	Deep thinker
Not being able to remember people's names	Good at remembering numbers
Not being personable	Volunteering to help the elderly and veterans
Obsessive	Determined
Opinionated	Most friends value my opinion
Over-analytical	Studious
Over-analytical	Thorough
Overconfidence	Happy always
Overconfidence	Confident
Panic	Intelligence
Passive aggressive	Calm non-confrontational
Perfectionism	Driven to excel
Pessimistic	think things through
Pessimistic	Realistic
Pessimistic	Realistic
Pessimistic	None
Pessimistic	Stubbornness

(continued on next page)

Table 1 (continued)

Attribute	
Negative	Positive
Pessimistic	Clarity about life and the future
Pride	Work efficiency
Procrastinator	Have the ability to see the big picture
Procrastinator	Think things through before I do them
Procrastinator	Honest
Procrastinator	Decisive
Procrastinator	Creative, though I do not think the traits are strongly connected
Procrastinator	I tend to be more laid back
Push over	Kind
Quick to judge	The ability to see all the possibilities
Reserved	Focused
Reserved	None
Scatterbrained	Creativity
Self-indulgent	High self-esteem
Selfishness	Tough
Sensitive	Empathetic
Shy	Reserved
Shy	Detailed
Shy	Modesty
Smoking	Relaxation
Socially awkward	Good observer
Stubborn	Ambitious
Stubborn	Persistent
That I trust people too easily	That I am able to trust people
Too nice	Likeable
Too Skinny	Healthy
Unaggressive	Kind
VERY quick to anger	Competence
Withdrawn	Analytical
Worrier	Cautious

### Study 2: silver lining theory and performance in a college sample

After establishing the prevalence of silver lining theories, we assessed whether inducing a silver lining theory influenced performance. We used the specific silver lining theory that the negative attribute of impulsivity is associated with the positive attribute of creativity. The veracity of the link between impulsivity and creativity is difficult to ascertain (Schulberg, 2001; Ward, 1968). However, people believe that impulsivity is associated with creativity: in a pilot sample, 65 of 119 participants (54.62%) selected creativity as a trait that impulsivity was associated with.

We manipulated the attribute of impulsivity by giving participants bogus feedback that they were either impulsive or not impulsive. We subsequently manipulated the silver lining theory of impulsivity with a fabricated article that either supported or refuted the link between impulsivity and creativity.

We measured effort invested in the domain of the positive attribute (i.e., creativity) implied by the silver lining theory by assessing performance on the Alternative Uses task (Guilford, 1967), a standard measure of divergent thinking. Because we argue that holding a silver lining theory leads people who believe that they possess a negative attribute to invest more effort in the domain of the positive attribute, we used the most effort-based indicator of performance on this task, creative fluency (De Dreu, Baas, & Nijstad, 2008). Creative fluency, the quantity of responses generated, is more effort-dependent than measures of response quality.

We hypothesized an interaction effect between the attribute and silver lining theory manipulations. Among individuals made to believe that they possess a negative attribute (i.e., are impulsive), those given the silver lining theory that the negative attribute is related to a positive attribute (i.e., creativity) should show greater effort-based performance in the domain of the positive attribute compared to those not given the silver lining theory. The silver lining theory should not affect performance for those who do not believe that they possess the relevant negative attribute (i.e., are not impulsive).

### Method

#### Participants and design

A total of 102 undergraduates completed the study for partial course credit. Five participants (5%) were excluded for failing an information processing check assessing whether participants read the silver lining theory manipulation article. Our final sample consisted of 97 participants (76 female, 2 unreported) who were  $M = 19.68$  ( $SD = 1.91$ ) years old. Participants were randomly assigned to one of the four conditions of a 2 (Attribute: impulsive, not-impulsive)  $\times$  2 (Lay Theory: silver lining, no silver lining) between-subjects factorial design.

#### Procedure and materials

Measures were completed in the order presented below.

#### Impulsivity attribute

To manipulate the attribute of impulsivity, we gave participants bogus feedback on the Barratt Impulsiveness Scale Version-11 (BIS-11; Patton, Stanford, & Barratt, 1995). The BIS-11 has 30 items assessing impulsive behaviors and preferences on a 4-point scale. The theoretical range of scores is 30–120, with healthy adults typically around 64 (Spinella, 2007). Participants received a result printout indicating that they were either in the 78th percentile (impulsive condition) or the 28th percentile (not-impulsive condition) of impulsivity.

#### Silver lining theory

We manipulated the silver lining theory via a fabricated news article (see Carr, Dweck, & Pauker, 2012). Participants read an article that either supported (silver lining condition) or refuted (no silver lining condition) the association between impulsivity and creativity. Both versions consisted of an article presumably from *The Boston Globe* describing ostensible scientific findings on the association between

impulsivity and creativity. The silver lining article was entitled, “Scientist supports impulsivity–creativity link.” An excerpt from the article stated:

the Carson team was able to conclude that there *is a strong link* between impulsivity and creativity. “The results were striking,” says Dr. Carson when asked about his recent findings, “and the data speaks for itself...all of the research tells us that people who are impulsive are *more creative*” (italics added)

The no silver lining article was entitled, “Scientist refutes impulsivity–creativity link.” The italicized phrases were replaced with “no link” and “no more creative than anyone else.” Otherwise, the articles were identical.

#### Information processing check quiz

Participants completed a multiple-choice quiz on the content of the silver lining article. The critical item asked participants to answer, “The research on the association between creativity and impulsivity...” by selecting either a) strongly supports a link, b) strongly refutes a link, or c) is inconclusive. Participants who failed to answer correctly were excluded, as they neither followed instructions nor looked at the article.

#### Impulsivity attribute manipulation check

We used the GoStop Impulsivity Paradigm (Dougherty, Mathias, & Marsh, 2003) to assess the impulsivity attribute manipulation. Participants attended to a series of five-digit numbers presented on a screen for 500 ms. Half of the numbers were target trials (matching stimuli) and half were filler trials (novel stimuli). Half of the target trials were “stop” trials, in which a number presented in black (go signal) changed to red (stop signal) after a randomized delay. Participants were instructed to respond to target trials by clicking the mouse, but withhold responding to stop trials. The primary variable of interest was number of responses to stop signals divided by the total number of stop trials (Dougherty, Mathias, Marsh, & Jagar, 2005), which is assessed on 150 ms-delay trials (e.g., Mathias et al., 2011). We expected that, as the result of a self-fulfilling prophecy, participants in the impulsive condition would have a higher proportion of responses (i.e., behave more impulsively) than those in the not-impulsive condition.

#### Creative performance

We used the Alternative Uses task (Guilford, 1967) as a measure of effort-based creative performance (Förster, Friedman, Butterbach, & Sassenberg, 2005). Participants were presented with an ordinary object (a nail), and instructed to generate as many creative uses for it as possible in 3 min. We summed the total non-redundant uses generated for the object.

## Results and discussion

#### Descriptive analyses

The total score on the BIS-11 was  $M = 64.45$  ( $SD = 10.12$ ;  $\alpha = .83$ ). Participants responded to  $M = .33$  ( $SD = .21$ ) of the 150 ms stop trials on the GoStop task. Participants generated  $M = 8.94$  ( $SD = 3.97$ ) different uses on the Alternative Uses task.

#### Impulsivity attribute manipulation check

We performed a 2 (Attribute: impulsive, not-impulsive)  $\times$  2 (Lay Theory: silver lining, no silver lining) between-subjects ANOVA with the proportion of responses to 150 ms stop trials as the dependent variable. There was a main effect of Attribute,  $F(1, 92) = 3.85$ ,  $p = .053$ ,  $\eta^2 = .040$ . Our attribute manipulation was successful: individuals in the impulsive condition responded to more stop trials ( $M = .37$ ,  $SD = .22$ ) than individuals in the not-impulsive condition ( $M = .29$ ,

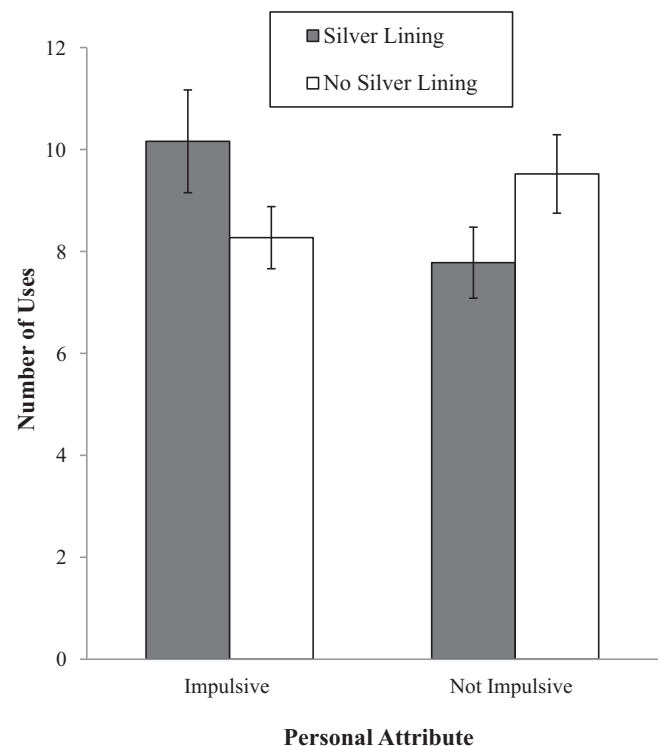
$SD = .19$ ). There was no main effect of Lay Theory,  $F(1, 92) = .85$ ,  $p = .36$ , nor an interaction effect of Attribute and Lay Theory,  $F(1, 92) = .24$ ,  $p = .63$ .

#### Creative performance

We performed a 2 (Attribute: impulsive, not-impulsive)  $\times$  2 (Lay Theory: silver lining, no silver lining) between-subjects ANOVA with the number of uses generated on the Alternative Uses task as the dependent variable. There was no main effect of Attribute,  $F(1, 93) = .50$ ,  $p = .48$ , and no main effect of Lay Theory,  $F(1, 93) = .01$ ,  $p = .92$ . We observed the predicted Attribute by Lay Theory interaction effect,  $F(1, 93) = 5.19$ ,  $p = .025$ ,  $\eta^2 = .053$ . In the impulsive condition, those who were made to believe in a silver lining theory generated more uses ( $M = 10.16$ ,  $SD = 5.04$ ) than those who were not ( $M = 8.27$ ,  $SD = 2.92$ ),  $t(93) = 1.72$ ,  $p = .044$ ,  $d = .46$ . In the not-impulsive condition, there was a non-significant trend in the opposite direction: individuals given a silver lining theory ( $M = 7.78$ ,  $SD = 3.34$ ) generated fewer uses than those who were not ( $M = 9.52$ ,  $SD = 2.91$ ),  $t(93) = 1.51$ ,  $p = .07$ ,  $d = .56$  (Fig. 1).

To rule out the possibility that the interaction effect was due to experimenter demand, participants rated their creativity at the end of the study. If the observed effect was due to participants conforming to how creative they thought they were expected to be, we should have observed differences in self-reported creativity. There were no differences in self-reported creativity as a function of Attribute, Lay Theory, or their interaction, all  $F_s < .71$ ,  $p_s > .40$ , suggesting that this was not the case.

Participants led to believe that they possessed a negative attribute (were impulsive) showed greater effortful performance in the positive attribute domain (generated more uses on an Alternative Uses task) when given the respective silver lining theory. This effect of the silver lining theory on performance did not enhance effortful creative behavior among people induced to believe that they were not impulsive (for



**Fig. 1.** Mean differences in effortful creative performance measured by the number of different uses generated in an Alternative Uses task as a function of the induced belief to possess the personal attribute of impulsivity and the silver lining theory that impulsivity is associated with creativity (Study 2). Error bars represent the standard error.

whom the silver lining theory did not apply). This suggests that a silver lining theory shapes effortful performance in the domain of the positive attribute.

### Study 3: silver lining theory and performance in an online sample

We wanted to replicate this finding in a different population, so in Study 3 we used a diverse online sample. We again predicted that individuals made to believe that they possessed a negative attribute (impulsivity) should have greater effort-based performance in the domain of the positive attribute (creativity) when a silver lining theory is given vs. refuted. No enhanced performance for participants with a silver lining theory was expected if participants did not believe that they possessed the relevant negative attribute.

## Method

### Participants and design

A total of 107 participants from Amazon's Mechanical Turk completed the study for \$.25. Eight participants (7%) were excluded for demonstrating they did not understand the percentile feedback in the attribute manipulation check. Our final sample consisted of 99 participants (73 female) who were  $M = 34.88$  ( $SD = 13.79$ ) years old.

### Procedure and materials

The design and procedure in Study 3 were the same as those in Study 2, except that all materials were presented online, and the impulsivity attribute manipulation was checked by self-report rather than behaviorally. After receiving the percentile feedback on impulsivity, participants indicated how impulsive they were on a continuous sliding scale from 0 = very unimpulsive to 100 = very impulsive. To ensure that participants understood the silver lining manipulation, they were required to reread the article until they passed a related quiz. As dependent variable, participants completed two additional trials of the Alternative Uses task, generating uses for a brick, a newspaper, and a nail. We summed the total non-redundant uses generated for all of the three objects.

## Results and discussion

### Descriptive analyses

The total score on the BIS-11 was  $M = 65.72$  ( $SD = 12.74$ ;  $\alpha = .88$ ). Participants rated themselves at the midpoint of a 100-point sliding impulsivity scale,  $M = 49.72$  ( $SD = 29.14$ ). On the Alternative Uses task, participants generated  $M = 27.68$  ( $SD = 12.94$ ) uses total.

### Impulsivity attribute manipulation check

We performed a 2 (Attribute: impulsive, not-impulsive)  $\times$  2 (Lay Theory: silver lining, no silver lining) between-subjects ANOVA with self-reported impulsivity (0 = very unimpulsive, 100 = very impulsive) as the dependent variable. There was the expected main effect of Attribute,  $F(1, 95) = 803.68$ ,  $p < .001$ ,  $\eta^2 = .89$ . Individuals in the impulsive condition rated themselves as more impulsive ( $M = 76.84$ ,  $SD = 9.35$ ) than individuals in the not-impulsive condition ( $M = 22.04$ ,  $SD = 9.81$ ). There was no main effect of Lay Theory,  $F(1, 95) = .87$ ,  $p = .35$ , nor an interaction effect of Attribute and Lay Theory,  $F(1, 95) = .52$ ,  $p = .48$ .

### Creative performance

We performed a 2 (Attribute: impulsive, not-impulsive)  $\times$  2 (Lay Theory: silver lining, no silver lining) between-subjects ANOVA with

the sum total of uses generated for all three trials of the Alternative Uses task as the dependent variable. There was no main effect of Attribute,  $F(1, 87) = .53$ ,  $p = .77$ , nor main effect of Lay Theory,  $F(1, 87) = 1.74$ ,  $p = .19$ . Importantly, we observed the predicted Attribute by Lay Theory interaction effect,  $F(1, 87) = 4.91$ ,  $p = .029$ ,  $\eta^2 = .053$ . In the impulsive condition, those made to believe in a silver lining theory generated more uses ( $M = 32.05$ ,  $SD = 15.97$ ) than those who were not ( $M = 22.54$ ,  $SD = 10.43$ ),  $t(87) = 2.53$ ,  $p = .01$ ,  $d = .70$ . In the not-impulsive condition, those who were given a silver lining theory ( $M = 28.05$ ,  $SD = 13.92$ ) and those who were not ( $M = 30.46$ ,  $SD = 14.35$ ) did not differ in uses generated,  $t(87) = .62$ ,  $p = .53$ ,  $d = .17$  (Fig. 2).

Replicating Study 2, participants in the silver lining condition invested more effort in performance in the positive attribute domain, but only if they had been induced to believe they possessed the relevant negative attribute. Interestingly, the impulsive, no silver lining condition in Study 3 showed greater decrease in effort relative to the same condition in Study 2. This effect may have been due to those in the online-for-pay sample being less intrinsically motivated than the college sample and thus more readily accepting of a reason to invest less effort.

### Study 4: adding a no information control condition

In Study 4, we tested the assumption that holding a silver lining theory increases effortful performance in the positive domain of the silver lining theory. We added a neutral control condition that involved reading a passage of nonsense text to test our hypothesis that among those with the negative attribute, those given a silver lining theory would have greater effort-based performance than those given no information about a silver lining theory. We hypothesized a similar effect in the opposite direction for the no silver lining condition. As some individuals in the no information condition should hold a preexisting silver lining theory (over half of participants in our pilot), those in the no silver lining condition who had a possibly preexisting silver lining explicitly refuted should exert less effort than those in the no information condition. Finally, we assessed affect both after the silver lining theory manipulation

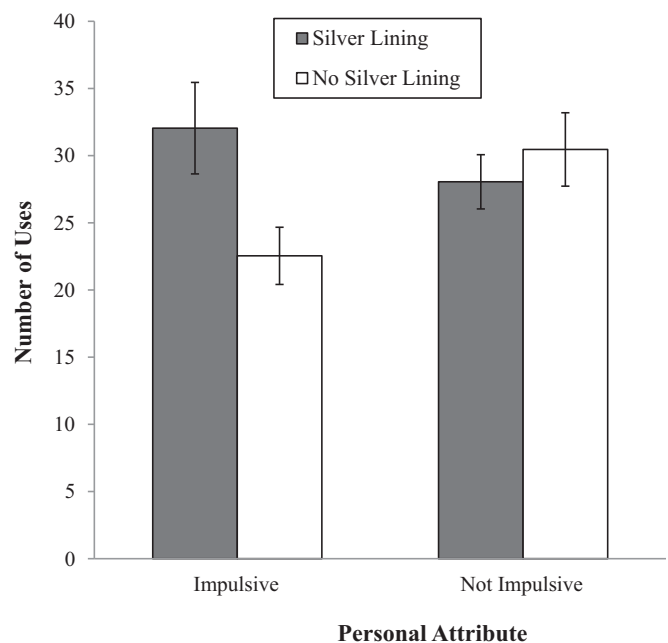


Fig. 2. Mean differences in effortful creative performance measured by the total number of different uses generated in an Alternative Uses task as a function of the induced belief of possessing the personal attribute of impulsivity and the silver lining theory that impulsivity is associated with creativity (Study 3). Error bars represent the standard error.

and after the creativity task to investigate whether the effects were due to the silver lining theory affecting mood.

#### Participants and design

A total of 124 participants from Amazon's Mechanical Turk completed the study for \$.25. Fifteen participants (12%) were excluded using the same criteria as in Study 3. Our final sample consisted of 111 participants (73 female) who were  $M = 37.39$  ( $SD = 14.54$ ) years old. Participants were randomly assigned to one of three Lay Theory conditions: silver lining, no silver lining, and no information about silver lining (neutral).

#### Procedure and materials

The procedure in Study 4 was identical to Study 3, except for the following modifications. All participants received the impulsive attribute condition manipulation. In the neutral condition, participants were instructed to cross out every letter "t" that occurred in a passage of nonsense Latin text (lorem ipsum). Participants completed the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) after the condition manipulation and after the Alternative Uses task.

### Results and discussion

#### Descriptive analyses

The total score on the BIS-11 was  $M = 65.52$  ( $SD = 13.34$ ;  $\alpha = .90$ ). Participants rated themselves above the midpoint of a 100-point sliding impulsivity scale,  $M = 79.06$  ( $SD = 10.00$ ), comparable to individuals in the Study 3 impulsive condition ( $M = 76.84$ ). Participants generated  $M = 27.40$  ( $SD = 9.88$ ) uses total on the Alternative Uses task.

#### Creative performance

We conducted a planned linear contrast to test our hypothesis (no silver lining =  $-1$ , neutral =  $0$ , silver lining =  $1$ ) that individuals in the silver lining condition would perform more creatively than the neutral condition, and those in the no silver lining condition would perform less creatively than those in the neutral condition. The contrast was significant,  $F(1, 106) = 4.46$ ,  $p = .037$ ,  $\eta^2 = .04$ . Individuals in the silver lining condition ( $M = 29.68$ ,  $SD = 10.04$ ) generated more uses than those in the neutral condition ( $M = 27.86$ ,  $SD = 11.02$ ), while those in the no lining condition ( $M = 25.09$ ,  $SD = 8.59$ ) generated fewer uses than in the neutral condition. There were no significant differences in positive or negative affect on the PANAS as a function of condition, all  $F_s < 1.68$ ,  $p_s > .19$ , suggesting that performance differences were not due to the silver lining theory manipulations affecting mood.

#### General discussion

We investigated the lay theory that a negative personal attribute is associated with a positive personal attribute (i.e., a silver lining theory). We found that silver lining theories are pervasive: the majority of individuals readily endorse silver lining theories for their personal negative attributes. We also established that an induced silver lining theory influences effortful performance in the domain of the positive attribute. In both a college and an online sample, we demonstrated that holding the silver lining theory that impulsivity is related to creativity leads to better performance in an effortful creativity task among participants who were induced to believe they were impulsive. And while inducing a silver lining increases effortful performance, refuting a silver lining decreases effortful performance. Such theories may be used to compensate for unwanted behavior in the domain of the negative attribute by investing effort in the related positive attribute. As these studies

were limited to one specific silver lining theory, additional research should explore how these findings generalize to other silver lining theories.

We suggest that the increases in effortful creative performance were not due to experimenter demand. If participants in the impulsive, silver lining condition were conforming to the experimental context, they should have reported being more creative. As we did not find differences in self-reported creativity, it is unlikely that differences in behavioral creativity were due to participants believing that they were expected to be more creative.

The observed pattern of results suggests that inducing a silver lining theory does not just facilitate dissonance reduction after individuals with generally positive self-views are made aware that they possess a negative attribute. Giving a silver lining theory to individuals made aware that they were impulsive should have sufficed to align their views of their selves as positive by justifying the negative attribute. That we observed additional differences in effortful creative performance after the silver lining theory induction suggests that the effect on performance is not the result of dissonance reduction. However, the current research cannot rule out that participants are resolving dissonance via behavioral change.

Regarding the purpose of silver lining theories, we propose that a silver lining theory is more than just two traits "going together," and instead entails the belief that strength in one domain compensates for weakness in another. We would not expect the same changes in behavior with other combinations of traits (e.g., two positive traits). Strong performance in the domain of the positive attribute may compensate for the negative attribute by directly affirming the specific positive attribute pointed to by the silver lining theory, or by indirectly affirming the general self (Steele, 1988). If the high performance allows individuals to specifically compensate by affirming the positive attribute of the silver lining theory, giving individuals positive feedback on the positive attribute should obviate the silver lining theory's effect. Conversely, if the high performance allows individuals to compensate more generally by affirming the integrity of the self, then affirming their core values (e.g., Steele & Liu, 1983) should suffice to eliminate the silver lining theory's effect. As the current research does not speak to the compensatory function, however, additional research is necessary.

Research focusing on compensatory beliefs about others (cf. Murray, 1999) has explored perceived associations between low competence with high warmth (Fiske, Cuddy, & Glick, 2007), low agency with high experience (Gray, Knobe, Sheskin, Bloom, & Barrett, 2011), and low physical attractiveness with high intelligence (Kay, Jost, & Young, 2005). Like these lay theories, the silver lining theory considers compensatory attributes; the silver lining theory diverges from this work, however, by considering beliefs as applied to the self. Research on beliefs applied to the self has, with some exceptions (e.g., Job, Dweck, & Walton, 2010, who investigated lay theories of willpower as a limited resource), focused on the malleability of personal attributes. The silver lining theory describes a new dimension on which lay theories about personal attributes can vary: organization. Future research may investigate how lay theories of malleability interact with lay theories of organization—a silver lining theory may have a different effect on effortful performance depending on whether an individual believes that the relevant attributes are fixed or malleable.

The current research cannot speak to the process through which a silver lining theory affects performance. It may be that activating a silver lining theory raises self-efficacy expectancies in the domain of the positive attribute, as positive situation-specific feedback can heighten self-efficacy (Bandura, 1997, 2012; Oettingen, Marquardt, & Gollwitzer, 2012). Activating a silver lining theory might allow individuals to interpret having a negative attribute as feedback on possessing the positive attribute, increasing efficacy in the positive attribute domain. Future research should explore the exact mechanism through which the silver lining theory heightens effortful performance in the positive attribute domain.

## Conclusion

A silver lining theory is a lay theory in which an individual believes that a negative attribute is related to a positive attribute. The present research shows that this form of lay theory is prevalent, and leads to increased effort-based performance in the domain of the positive attribute. Paradoxically, then, van Gogh's silver lining theory that his attacks were associated with his creativity may have increased his creative output in the asylum as he was continually made aware of his failure to control his attacks.

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