PUBLISHED VERSION

Lance Storm
Reactance in a picture-identification task using a fuzzy-set encoded target pool
Journal of the Society for Psychical Research, 2019; 83(3):129-143

http://hdl.handle.net/2440/129220

REACTANCE IN A PICTURE-IDENTIFICATION TASK USING A FUZZY-SET ENCODED TARGET POOL

By Lance Storm

ABSTRACT

It is theorized that the sheep-goat effect may be partly attributable to 'reactance', which is hypothesized to have negative effects on psi performance. A reactance treatment in the form of an opinionated communication (putatively perceived as a threat to freedom) can raise reactance, which remains high if no outlet is provided (Brehm, 1966). This induced effect can result in a noncompliant attitude and response, purely as a knee-jerk reaction to the threat. It is hypothesised that higher noncompliant behaviour (e.g., psi-missing in psi tasks) can be induced in reactant participants, and goats may be particularly vulnerable. Storm, Ertel and Rock (2013), Storm and Rock (2014b), and Storm (2019), found support for the reactance hypothesis. The reactance principle was used in the present study to manipulate psi in a negative direction, but the present study also took a more focused look at the psychological responses to the reactance treatment, so as to gauge their effects on psi. Two randomly-formed groups participated in a picture-guessing task (total $N = 80$): (a) 'Reactants' ($n = 40$), and (b) 'Controls' (i.e., 'non-reactants'; $n = 40$). Direct-hits was the psi measure in a five-choice design (MCE = 20%). A significant sheep-goat effect was found. Reactants did perform at chance only (hit rate = 20%), whereas the non-reactants scored considerably higher (hit-rate = 27.5%), but the difference was not significant (probably due to low N). Each group (reactants and controls) can be subdivided into sheep and goats: Reactant goats were the worst performing group. Scores on measures of psychological responses to the reactance treatment (i.e., 'perceived threat to freedom' and 'anger') did not correlate with direct hitting.

INTRODUCTION

Gertrude Schmeidler (1945) proposed that participants in psi experiments either believed in the demonstrability of ESP (these she called 'sheep'), or they rejected the possibility (so-called 'goats') — sheep tend to psi-hit; goats tend to psi-miss (see Lawrence, 1993; Palmer, 1971, 1977; Storm & Tressoldi, 2017). This psi-performance difference is known as the sheep-goat effect. Parapsychologists agree that sheep tend to comply with the experimenter's instructions, based on a tacit understanding between the experimenter and the compliant sheep, the latter of whom then endeavour to give their best psi performance (as in psi-hitting). Ironically, experimenters assume that those same instructions for goats *to comply* is somehow appropriate for eliciting poor performances from them (such as chance-scoring or psi-missing). When

goats' performances are poor, experimenters may fall back on the vindication hypothesis (i.e., goats' agenda is target avoidance to disprove the psi hypothesis; Palmer, 1972), thus justifying the experimenter's assumption, but it may well be the case that experimenters have only been evoking cognitive dissonance in goats which hardly equates as an *instruction* to perform badly. However, even if it might seem appropriate and more fruitful to ask goats out-rightly to be noncompliant to get full 'goat-ish' responses, experience shows that goats generally do not respond favourably to the idea of proving any kind of psi. To get the strongest sheep-goat effects, it would be necessary to influence goats surreptitiously to perform badly, and it is hypothesized that such an influence can be demonstrated by manipulating the fundamental goat nature.

Past studies (e.g., Wiseman & Schlitz, 1997; West & Fisk, 1953) have demonstrated how sensitive psi is to change in 'psychological ambience', even though these studies were experimenter focused, and did not take the sheep-goat effect into consideration. Nevertheless, the lesson has been learned: The answer to the 'goat problem' would seem to lie in finding out what makes them tick, psychologically speaking, and then manipulate that state to see if it has any effect on the psi outcome. In fact, evidence exists to show that goats can be manipulated into changing their psi performance. For instance, Lovitts (1981) formed two groups: (1) participants who were told subliminal perception explains ESP; and (2) participants who were told they were in an ESP experiment. Condition 1 was a masked ESP test. Responses were recorded on a sheet fixed to an envelope containing a target list. A significant interaction effect showed that goats had been manipulated to score like sheep, and vice versa. However, even though Lovitts's design had a parapsychological aim, her findings only demonstrated that goats were compliant simply because they thought they were in a psychological experiment — i.e., goats were not seeking vindication to justify their skepticism about psi. Noncompliance, however, was demonstrated in Condition 2.

So-called psychological reactance may prove that the typical psi study, by its design protocol — that is, its expectation of compliance — poses a problem for goats. In accordance with Psychological Reactance Theory (PRT; Brehm, 1966), if attitudinal or behavioural freedom is threatened, a person can become motivationally aroused, thus generating psychological reactance. The reactant individual may then adopt a noncompliant attitude or behaviour that even results in so-called 'boomerang effects' (i.e., doing the opposite of what is asked) aimed at restoring freedom (Dillard & Shen, 2005; Silvia, 2005). In the laboratory, freedom is threatened by way of a reactance prime; a short vaguely threatening communication (Silvia, 2005) presented in a 'matter-of-fact' way as basic information about a relevant task.

Following the principles of PRT, reactant behaviour in goats may explain boomerang effects like psi-missing (though sheep too can be affected), with the causal mechanism for that effect being reactance itself. Indeed, in a forced-choice ball selection test (designed by Ertel, 2005), where numbers on concealed ping-pong balls had to be guessed, Storm, Ertel, and Rock (2013) found that psi performance was significantly lower for 'reactants' (those in a

reactance condition) compared to controls, and reactant goats performed significantly worse that control goats. In an *I Ching* study featuring a Q-Sort design coupled with an RNG-PK task (Storm & Rock, 2014b), similar effects were found: (i) Q-Sort scores of 'reactants' were lower than 'controls', and (ii) reactant goats scored significantly lower than control goats on Q-Sort scores. In a free-response picture-guessing (i.e., picture-identification) task, Storm (2019) found the reactance treatment generally affected goats, but not sheep whose psi performance was fairly consistent across treatment regimes. These regimes included a mix of imagery cultivation (similar to the guided imagery technique) and reactance treatment, though it was later thought likely that participants were confused by the conflicting treatments (especially 'indecisives', who are mid-way scorers on paranormal belief — i.e., not sheep or goats). Generally, however, the reactance effect was as expected. It is therefore argued that one probable cause of the 'goat part' of the sheep-goat effect is reactance.

Storm and Rock (2014a), and Billows and Storm (2015), have since found that *trait* reactance (measured on the Psychological Reactance Scale; Hong & Faedda, 1996) does not correlate significantly with the psi outcome suggesting that the primary variable of interest is *state* (i.e., situation-specific) reactance; not *trait* reactance. In psychological studies, the proximal cause of state reactance is found to be *perceived threat to freedom*, which is measurable (Dillard & Shen, 2005). Perceived threat to freedom often manifests, or can be interpreted, as an "*intent to persuade*" (p. 148), suggesting that persuasion itself is a form of manipulation of a person's behaviour. Hence, Dillard and Shen (2005) operationalized perceived threat to freedom as impingement on a person's (i) *freedom to choose*, and (ii) *to decide*, both of which were thought to relate to how much a person felt that they were being (iii) *manipulated* and (iv) *pressured* to respond in a way demanded of them in accordance with a threatening message. If threat to freedom can be seen as a form of, in effect, unsolicited persuasion, these four elements should all correlate. Indeed, Dillard and Shen (2005) found that a global measure of these four items combined, as *perceived threat to freedom*, produced a Cronbach's alpha of 0.87. Their study showed that participants who read a 'high-threat' message reported significantly higher threats to freedom compared to reports from participants who read a 'low-threat' message.

Also related to state reactance is *anger*, which Silvia (2006) describes as "negative responses to the [threatening] message" (p. 675). Brehm (1966) was more specific, describing the 'negativity' of reactance as "hostile and aggressive feelings" (p. 9). Dillard and Shen (2005) argued that anger belongs to a 'family' of concepts that index anger, and in this family they include "irritation, annoyance, and rage" (with 'rage' operationalized as 'aggravation'). If the indexing is valid, these four variables should all correlate. In fact, Dillard and Shen (2005) reported that, anger, irritation, annoyance, and aggravation, worked well as a combined 'anger' measure (by pooling item scores), with a highly reliable Cronbach's alpha ranging between 0.92 and 0.94. In their study, two high-threat treatments both elicited the highest anger ratings, and these were both significantly higher than anger measures taken for the two low-threat conditions.

These two measures of state reactance — *perceived threat to freedom* and *anger* — measure cognitive and emotional states, respectively. They have not been tested in psi studies, so while there is some evidence that the reactance treatment has an effect on psi performance, the degree to which state reactance is related to psi is not known, especially since there are different ways of measuring state reactance. The main issue here is that we do not expect that all goats respond in the same way to threatening messages (i.e., not all goats are reactant), so that some goats may have a consistent way of performing in psi tasks whether or not they have been administered a reactance treatment; nor can it be said that all sheep are immune to reactance. Generally, however, it is proposed that perceived threat to freedom and anger, as elements of state reactance, predict psi outcomes.

Rationale for the Present Study

Trait and state reactance have not been tested in a free-response psi experiment so the hypothesized negative effects of reactance on psi performance will be sought in a precognitive picture identification task (I refrain from using the word *guessing* as the psi hypothesis presupposes that psi is not the product of chance or luck). A so-called *fuzzy set encoded target pool*, consisting of 300 pictures compiled by May (2007; May et al., 2012) will be used. May et al. (2012) have argued that a quantitative description of imprecise (conceptually vague or 'fuzzy') target material is possible by applying a mathematical analysis to analysts' ratings of photographic images. The images are encoded on a range of descriptive elements, and then cluster analysis is used to make sure images fall into distinctive categories. Categories within a Group are orthogonal to (independent of) each other, so that each target set is comprised of five pictures that bear virtually no similarity to each other, yet pictures within a category are strongly related. If, for example, the randomly selected target picture is one of five pictures from the Canyons Category (Category 2, Group 1), then each of four decoys (for a "$k = 5$" design) must be randomly drawn from each of the four remaining Categories in Group 1 (i.e., Bridges, Cities, Oriental Structures, and Waterfalls). Thus, orthogonality facilitates the judging and ranking processes by eliminating the idiosyncrasies present in conventional target sets which complicate the judging and ranking processes.

The present study also seeks insight into (i) the psi performance difference between reactants and controls; (ii) the psi performance difference between sheep and goats; and (iii) the relationship between reactance and psi. *Trait* reactance (measured on *Hong's Psychological Reactance Scale*: HPRS; Hong & Faedda, 1996), and *state* reactance (measured as *perceived threat to freedom* and *anger*), and paranormal belief (measured on the Australian Sheep-Goat Scale; Thalbourne, 1995), are the measures of interest.

Results from this study may help answer the long-standing question concerning the cause(s) underlying the sheep-goat effect, and how the differences in psi scoring between sheep and goats must necessarily be psychological, and may even be reduced to two fundamental issues: compliance and reactance.

Method

Participants

First-Year Psychology students, who signed-up online, were tested and they received credit for participation as part of their curriculum program (the recruitment method used is called the Research Participation System set up by the School of Psychology, University of Adelaide). There were a number of participants who became aware of the project through online advertisements on various university websites. They contacted the experimenter (L. S.) via SMS or email so that a suitable day and time for testing could be arranged.

Also, with appropriate approval, a 'ballot box' and invitation letters were placed in various locations on the University of Adelaide campus. Participants dropped contact slips into the box, and these were collected on a daily basis by L. S.. The study was approved by the University of Adelaide School of Psychology Human Ethics Subcommittee (Approval Code Number 17/82). ($N = 80$).

Median score was used to demarcate the 'goats' group from the 'sheep' group. Reactants and Controls were randomly assigned (see *Procedure* for details).

Materials

The on-line test included an information page, consent page, demographics page, and the following measures: (1) Thalbourne's (1995) *Australian Sheep-Goat Scale* (ASGS) to measure paranormal belief and experience; (2) *Hong Psychological Reactance Scale* (HPRS; Hong & Faedda, 1996) to measure individual differences in reactance proneness; (3) *Perceived Threat to Freedom* — measured by four items (e.g., "*The message threatened my freedom to choose*"); (4) *Anger Scale* ("To what extent did this message make you feel … [irritated, angry, and annoyed]?");[1] (5) Gallery of 300 photographs (May, 2007): 12 Groups × 5 Categories × 5 photographs; and (6) A true-noise Random Number Generator (RNG; Schmidt, 1970, 1992) — the RNG was purpose-built by Helmut Schmidt (dimensions: 25 × 30 × 7.5 cm). On the face side are 12 green lamps in a circular array and a red LED score-display in the centre.[2]

Procedure

The procedure contained the following six steps. Step 1 (all participants): Participants read the information page, confirmed their consent, and completed the demographics, ASGS, and HPRS pages.

---

[1] The Spiritual Emergency Scale (Goretzki, Storm, & Thalbourne, 2014), the Reality Testing Deficits scale (Lenzenweger, Clarkin, Kernberg & Durham, 2001), and the Paranormal Belief Informedness Scale (Storm, Drinkwater, & Jinks, 2017), were also administered, for purposes to be explained in a follow-up article.

[2] Parapsychologist Helmut Schmidt (1928–2011) designed the RNG for Dr. Michael A. Thalbourne (1955–2010): "The noise-based random generator (a) starts from a noise diode whose signal is amplified, converted to a rectangular wave and fed into a two-stage binary counter. When a random bit is requested, a gate first interrupts the square-wave stream and then the status of the second stage of the binary counter is sampled to determine the binary random decision. . . . The two bits, from (a) and (b), are combined via the XOR [exclusive OR — i.e., 0,0 = 0; 0,1 = 1; 1,0 = 1; 1,1 = 0] operation to give the final bit for the experiment [i.e., each trial]. . . . Regarding the display, the 12 lights are consecutively illuminated in clockwise order" (Thalbourne, 2006, p. 310).

Step 2 (40 randomly-selected participants): Participants read the on-screen communication (from Storm et al., 2013):

This short communication was written by a university professor:

> "This Picture ID Task has been developed in parapsychology over many decades and I claim that it is the best of all procedures that have hitherto been applied in parapsychology. I am utterly convinced that psi exists and that participants cannot avoid letting their psi power come to the fore when they correctly predict a randomly generated target picture. Every person, I claim, is expected to display such power. *I know I have persuaded you about this. I know you agree with my opinion. In fact, you're really forced to agree because university students can't have differing opinions on this issue*".

The additional italicized sentences are the threatening elements (not italicized in the actual study); presented only in the reactance condition ($n = 40$). The other 40 controls did not get the italicized sentences.

All participants rated their reactions to the communication by completing the *Perceived Threat to Freedom Scale* (four items, each requiring a response on a five-point Likert scale: 'Strongly agree' = 1, 'Disagree' = 2, 'Neutral/Don't know' = 3, 'Agree' = 4, 'Strongly agree' = 5):

1. "The message threatened my freedom to choose";
2. "The message tried to make a decision for me";
3. "The message tried to manipulate me";
4. "The message tried to pressure me".

Participants then completed the *Anger Scale* (four items, each requiring a response between 'None of this feeling' = 0, to 'A great deal of this feeling' = 4):

1. "To what extent did this message make you feel irritated?";
2. "To what extent did this message make you feel angry?";
3. "To what extent did this message make you feel annoyed?";
4. "To what extent did this message make you feel aggravated?".

Administration of these two scales before the psi task comes right after the communication to see how they reacted to it. If reactance has been elicited, it should affect psi response.

Step 3 (all participants): The experimenter instructed the participant that they would use the RNG to generate a five-picture set which was displayed on the computer monitor.

Step 4 (all participants): The target set of five photos was generated using the RNG in 'Roulette Mode' (i.e., a random number of steps in clockwise motion simulating a roulette wheel). The selection procedure used numbered lights on the RNG, and following May et al.'s (2012) recommendation — randomly selected one of 12 Groups, followed by a five-picture set drawn from five Categories; one photo from each Category (presented on the Photo page).

Step 5 (all participants): The experimenter instructed each participant to guess which photo would be the future target generated by the RNG, and they ranked that photo #1. The next best choice was ranked #2, and so on until all photos were ranked. Rank numbers were entered underneath each corresponding photo. After ranking, the target page was presented.

Step 6 (all participants): Using the RNG, the participant generated one final target number (between 1 and 5 inclusive). The participant typed the

number into the space provided. The target photo was automatically shown on-screen and a message came up telling the participant what rank they gave that target photo. If the target photo was ranked #1, they scored a direct hit. Once completed the participant was debriefed (the measures were explained with results, all confidentially emailed out. They were invited to contact the author with any questions). All data was analysed using SPSS (see Hypotheses, next section). The database will be made available on the Psi Open Data repository (https://open-data.spr.ac.uk).

Hypotheses

1. There is (i) a reactance main effect (the reactance group scores lower than the non-reactance group on direct hitting [DV]); (ii) a Sheep-Goat main effect (in particular, reactant goats score lower than non-reactant goats on the DV). (Trait reactance is controlled as a covariate in a univariate ANCOVA test.)

2. There are relationships between psi scoring and: (i) perceived threat to freedom (state reactance); and (ii) anger (state reactance).

3. There are relationships between psi scoring and: (i) trait reactance (HPRS scores); and (ii) paranormal belief (RASGS scores).

RESULTS

Descriptives and Preliminary Findings

The planned sample of 80 participants had a mean age of 27 years ($SD = 12$ years); 42 males; 38 females. All stages were timed, and it was found that paranormal belief (RASGS) correlated positively and significantly with total time taken to complete the study, $r(78) = 0.23$, $p = .037$ (two-tailed), and age, $r(78) = 0.27$, $p = .017$ (two-tailed). These results suggest older sheep tended to take the most time with procedures, whereas younger goats rushed through them. These two effects have been found before by Storm and Rock (2014a) who also found that haste (possibly indicative of disinterest or lack of focus) had adverse effects on two psi outcomes, although this psi-inhibitory effect was not observed in the present study.

There were 40 participants in the Reactance condition, and 40 participants in the Control condition. For the two groups, raw hit rates, percentage hit rates, and other statistics are given in Table 1. These hit rates are only included for interest because both groups are relatively small, so the power to produce significant outcomes is greatly reduced, given that effect sizes in psi experiments tend to be weak. Besides which, the reactance group is expected to under-perform compared to normal expectations for free-response designs.

Participants 'selected' groups and categories using the Schmidt RNG. Using the Kolmogorov-Smirnov test (uniform distribution), no group was selected more often than any other, $z = 0.78$, $p = 0.573$ (two-tailed). RNG selections across the five categories were also random, $F(4, 316) = 1.45$, $p = .219$ (two-tailed). Picture ranking (choices) by participants did not show any systematic or systemic (non-random) patterns, $F(4, 316) = 0.37$, $p = 0.997$ (two-tailed).

TABLE 1

Showing hit rates for the reactance group and control group

Group	Hit Count	Direct Hits (%)[a]	Z	p	ESb	Mean Rank (*SD*)
Reactance	8	20.0	0.00	.500	0.00	2.95 (1.34)
Controls	11	27.5	0.99	.161	0.16	2.70 (1.47)

Note: [a] Mean Chance Expectation (MCE) = 20%; [b] ES = $z/\sqrt{n}$.

Neither age, sex, nor education level, correlated with direct hitting, but education correlated negatively and significantly with perceived threat to freedom, $r(78) = -0.22$, $p = .046$ (two-tailed), and positively and significantly with paranormal belief (RASGS), $r(78) = 0.27$, $p = .015$ (two-tailed). Education seemed to be a buffer against perceiving a threat to freedom, yet the more educated seemed more likely to have paranormal beliefs. Also, RASGS and trait reactance (HPRS) correlated positively and significantly, $r(78) = 0.25$, $p = .028$ (two-tailed), suggesting that sheep might be characterized by the reactance trait more than goats (although there was no significant difference between sheep and goats on trait reactance — see second dot point below).

Statistics for the four measures are as follows:

- Australian Sheep-Goat Scale (Rasch-scaled) Mean score = 22.18 (*SD* = 7.54); minimum = 8.13 (which matches the theoretical minimum); maximum = 43.39 (which matches the theoretical maximum). The distribution was normal. Median score = 22.44; used to demarcate the 'goats' group (≤ 22.44; $n = 41$) from the 'sheep' group (> 22.44; $n = 39$).

- Hong's Psychological Reactance Scale: Mean score = 32.50 (*SD* = 6.13); min. = 11 (theoretical min. = 11); max. = 46 (theoretical maximum = 55). The distribution was not normal (left-skewed). Trait reactance was not significantly different between sheep (33.26) and goats (32.30), $t(77) = 0.75$, $p = .456$ (two-tailed).

- Perceived Threat to Freedom Scale: The four elements of threat to freedom ('freedom to choose', 'freedom to decide', 'manipulation', and 'pressure') all correlated significantly, ranging between .49 and .76. The distribution was normal. Mean score = 12.76 (*SD* = 4.51); min. = 4 (which matches the theoretical min.); max. = 20 (which matches the theoretical max.). Cronbach's alpha for the combined threat to freedom measure was 0.87. Goats had a higher mean score (13.02) than sheep (11.87), but the difference was not significant, $F(1, 79) = 1.31$, $p = .128$ (one-tailed).

- Anger Scale: The four elements of anger (irritation', 'anger', 'annoyance', 'aggravation') all correlated significantly, ranging between .73 and .91. The distribution was not normal (left-skewed) with 35% of the sample saying they were not angry (i.e., 'None of this feeling' = 0). Mean score = 3.79 (*SD* = 4.17); min. = 0 (which matches

the theoretical min.); max. = 16 (which matches the theoretical max.). Cronbach's alpha for the combined anger measure was 0.94. Goats had a higher mean score (3.88) than sheep (3.69), but the difference was not significant, $F(1, 79) = 0.04$, $p = .422$ (one-tailed).

Planned Analyses

Hypothesis 1. There is (i) a reactance main effect (the reactance group scores lower than the non-reactance group on direct hitting [DV]); (ii) a Sheep-Goat main effect (in particular, reactant goats score lower than non-reactant goats on the DV). (Trait Reactance was controlled as a covariate in a univariate ANCOVA test.)

(i) The direct hit rate for the Reactance group was 27.5% which is higher than the hit rate of 20.0% for the Non-Reactance group. These percentages are in the directions hypothesized. However, the difference was not significant, $F(1, 75) = 0.43$, $p = .258$ (one-tailed).

(ii) The direct hit rate for sheep (mean RASGS = 27.82; $SD = 5.23$) was 33.3% (above MCE; 13 hits), which is higher than the hit rate of 14.6% (below MCE; 6 hits) for goats (mean RASGS = 16.83; $SD = 5.11$). These percentages are in the directions hypothesized. The sheep-goat effect was significant, $F(1, 75) = 3.75$, $p = .028$ (one-tailed).

Reactant goats (hit-rate = 13.6%) did perform worse than non-reactant (control) goats (hit-rate = 15.8%) on direct hits, but not significantly, $t(39) = 0.19$, $p = .425$ (one-tailed). As the various sub-groups are relatively small, the power to produce significant outcomes is greatly reduced. For a consideration of the psi performance of reactant goats specifically, see *Post Hoc Analyses.*

Hypothesis 2. There are relationships between psi scoring (direct hitting) and: (i) perceived threat to freedom; and (ii) anger.

(i) The relationship between direct hitting and perceived threat to freedom was positive, but very weak and not significant, $r(78) = .07$, $p = .518$ (two-tailed).

(ii) Due to the non-normal distribution of anger scores, Spearman's *rho* test was used to test this hypothesis. The relationship between direct hitting and anger was negative, but very weak and not significant, $rs(78) = -0.08$, $p = .465$ (two-tailed).

Hypothesis 3. There are relationships between psi scoring (direct hitting) and: (i) trait reactance (HPRS scores); and (ii) paranormal belief (RASGS scores).

(i) The relationship between direct hitting and HPRS was negative, but very weak and not significant, $r(78) = -0.02$, $p = .882$ (two-tailed).

(ii) The relationship between direct hitting and RASGS was positive, but very weak and not significant, $r(78) = .03$, $p = .793$ (two-tailed).

Post Hoc Analyses

In Hypothesis 1, it was proposed that the reactance treatment would have a negative effect on direct hitting. Even given the big difference of 20% for

'reactants' and 27.5% for controls, the difference was not significant, but the effect is suggested. It was also noted earlier that goats would be particularly affected by the reactance treatment (this effect has been found three times now: Storm, 2019; Storm et al., 2013; Storm & Rock, 2014b). As noted in results for Hypothesis 1 above, reactant goats (13.6%) did perform worse than control goats (15.8%) on direct hits, but not significantly. Note, however, that Figure 1 shows a performance increase for indecisives in the reactance treatment compared to their performance in the control condition (indecisives are mid-way scorers on paranormal belief: goats ≤ 19.61 [n = 25]; indecisives = 20.39 to 24.32 [n = 27]; sheep ≥ 24.91 [n = 28]). This effect has been observed previously: Storm (2016) reported that indecisives can score higher than goats and sheep *after* a reactance treatment, and following a similar finding, Storm (2019) described indecisives as a suggestible group who seem easily persuaded by the so-called threatening message; so much so that the treatment seems to encourage psi. Paradoxically, there is even suggestive evidence that perceived threat to freedom is related to direct hits, but for indecisives only, $r(25)$ = .31, p = .114 (two-tailed), which would approach significance if the test was one-tailed. When this suggested effect was looked at more acutely, it was found that of the four items, 'decision' (i.e., "The message tried to make a decision for me") was largely responsible for the effect since it correlated significantly with direct hits for indecisives only, $r(25)$ = .42, p = .028 (one-tailed).

As a consequence of the improvement in scoring for indecisives, the sheep-goat performance gap closes when indecisives' data is redistributed amongst sheep and goats, thus weakening the sheep-goat effect. To test this assumption by excluding indecisives in a re-analysis, the hit rate for reactant goats drops slightly to 13.3%, while the hit rate for control goats rises sharply to 20.0%, although the difference is still not significant given the small n, $t(23)$ = 0.43, p = .336 (one-tailed).

Recalling the test results for Hypothesis 2, it is noted that perceived threat to freedom and anger correlate positively and significantly, $r(78)$ = 0.54, p < .001 (two-tailed); anger tended to increase the more freedom was perceived to be threatened. When a partial bivariate correlation was run for direct hitting and perceived threat to freedom, controlling for anger, the correlation increased in strength, $r(77)$ = .12, p = .150 (one-tailed) — *cf.* result for *Hypothesis 2*(i) above. When a partial bivariate correlation was run for direct hitting and anger, controlling for perceived threat to freedom, the correlation also increased in strength, $r(77)$ = –0.11, p = .171 (one-tailed) — *cf.* result for *Hypothesis 2*(ii) above. At this stage, the weak relationships can be explained as chance effects, and this discussion is little more than academic at this stage, unless we allow for small n. The suggestion then is that anger inhibits psi, but perceived threat to freedom does not, although that counter-intuitive assumption may be entirely attributable to the peculiar behaviour of indecisives as shown above.

Recalling the test results for Hypothesis 3, it is noted that HPRS scores and RASGS scores correlate positively and significantly, $r(78)$ = 0.25, p = .028 (two-tailed). It is not understood why trait reactance might tend to increase with paranormal belief, but the implication is that sheep tend to be habitually
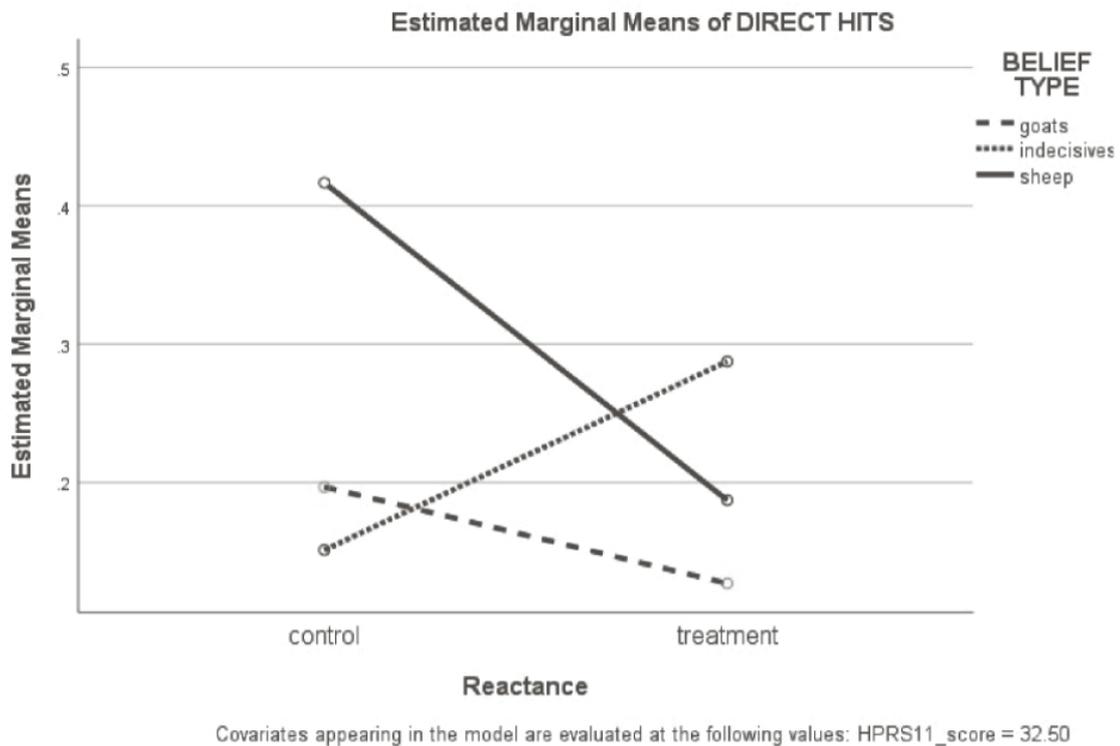
Estimated Marginal Means of DIRECT HITS

Figure 1. Direct Hits for two groups (controls and reactance treatment) by belief types (goats = dashed line, indecisives = dotted line, and sheep = solid line). The incline in performance (see dotted line) indicates that indecisives are an exception to the reactance treatment

more reactant than goats. However, as shown above (see *Descriptives and Preliminary Findings*), trait reactance is not significantly different between sheep and goats, so that while we might not expect to see the trait more often in sheep, the correlation suggests otherwise. It did not help to partial out the effects of one on the other to see if controlling them made a difference to the correlations tested in Hypothesis 3.

DISCUSSION

Following the principles of reactance theory (Brehm, 1966), a picture-identification task was used as a means of testing psi performances under reactance and control conditions. Prior to psi testing, all participants read a short opinion piece about the virtues of the "picture ID task", but half the sample were randomly presented with an additional component of text which was expected to threaten participants' freedom, given its excessively demanding tone. It was hypothesized that reactant individuals tend to adopt a noncompliant attitude towards psi tasks when their freedom is threatened, which can result in boomerang effects aimed at restoring freedom (Brehm, 1966; Dillard & Shen, 2005; Silvia, 2005).

Little is known about the psychological (attitudinal and behavioural) effects of reactance on psi, such as whether it is safe to assume that reactance

is necessarily triggered just because a threatening message is administered. Nevertheless, when compliance in a psi task is expected, goats (being nonbelievers, and therefore holding a sceptical attitude towards all things paranormal) will probably perceive the request as a threat to their freedom. For that reason, we may generally regard the responses of goats as being a special case of reactance behaviour (a kind of resistance or refusal to cooperate) distinct from the kind of motivation that impels sheep to comply.

To learn more about the nature of reactance, and what triggers it, the present study, following the work of Dillard and Shen (2005), sought to measure two factors that may be regarded as aspects of state reactance — namely (i) *perceived threat to freedom,* comprised of four elements: 'freedom to choose', 'freedom to decide', 'manipulation', and 'pressure'; and (ii) a measure of *anger,* comprised of the mandatory item 'anger', plus three other related items: 'irritation', 'annoyance', and 'aggravation'. Special focus was placed on goats to see whether psi-missing was underscored by a negative attitudinal response suggesting reactance. The only way to test this assumption is to try to induce reactance, and gauge its psychological effects using the series of items just listed.

Test results for Hypothesis 1 are encouraging — the sheep-goat effect was significant, and although the reactance effect was not significant it was in the direction hypothesized, with a very high hit rate of 27.5% for the control group compared to a score exactly at chance for the reactance group. A reactance effect is thus suggested, and it should be noted that the sample — and therefore the various groups — were small, so the power to yield significant effects was low in his study (NB: time and funding constraints limited testing to 80 participants). Nevertheless, the control group performed well with its hit rate well above MCE and an effect size of 0.16, which is comparable to the ganzfeld mean ES of 0.15 (Storm, Tressoldi, & Di Risio, 2010). By comparison, it did appear that the reactance treatment had some effect.

In a *post hoc* analysis, a reversal of effect for indecisives was observed: their performance improved under the reactance treatment. It may be due to the fact that indecisives are uncertain about their paranormal beliefs (and perhaps ultimately they are nascent sheep) but, with the right encouragement, they certainly are prepared to adopt sheep-like behaviours on psi tasks. The only question here is why the treatment should improve scoring. In fact, it was found *post hoc* that indecisives did not seem perturbed by the fact that their freedom to make their own decisions was threatened, and the more this freedom to decide was compromised, the better they did on the psi task. If this study is to be replicated, it would be necessary to modify the threatening message so that it is less persuasive (more challenging) to indecisives. It is clear that indecision may be a likely cause of Type II error in tests of the sheep-goat effect (Lawrence, 1993, tried to draw attention to the problem, but little interest was raised).

In testing Hypothesis 2, it was found that there were no significant relationships between direct hitting and the two cognitive and emotional measures (i.e., perceived threat to freedom and anger). Apart from the *post hoc* finding for indecisives (which produced a reversal of effect), the sample

seemed indifferent to their cognitive and emotional states, so that psi performance seemed unrelated to, or unaffected by them.

In tests on Hypothesis 3, trait reactance (HPRS) and paranormal belief (RASGS) did not correlate significantly with direct hitting. *Post hoc*, it was shown that there is a significant relationship between HPRS scores and RASGS scores, so that we can assume that the non-independence of these two variables meant that failure of one test would guarantee failure in the other. While it was thought that sheep may tend to be habitually more reactant than goats, it was also found that trait reactance is not significantly different between sheep and goats. It would be worthwhile conducting a replication study that includes: (i) a revision of the 'threatening' reactance communication so that it is less persuasive (more challenging); and (ii) more precise measures of reactance.

Conclusion

In the present study, the sheep-goat effect was considered to be negatively influenced by so-called 'reactance', a psychological effect that can be elicited through a mildly threatening communication (Brehm, 1966). It was hypothesized that goats may be particularly vulnerable to reactance. A reactance-treated group and a control group were formed. Reactants performed at chance (20%) as expected, whereas controls scored higher (27.5%), where MCE = 20% (though this difference was not significant). A significant sheep-goat effect was found.

School of Psychology   LANCE STORM
University of Adelaide
South Australia 5005
AUSTRALIA
lance.storm@adelaide.edu.au

REFERENCES

Billows, H., & Storm, L. (2015). Believe it or not: A confirmatory study on predictors of paranormal belief, and a psi test. *Australian Journal of Parapsychology, 15*, 7–35.

Brehm, J. W. (1966). *A theory of psychological reactance*. New York: Academic Press.

Dillard, J., & Shen, L. (2005). On the nature of reactance and its role in persuasive health communication. *Communication Monographs, 72*, 144–168.

Ertel, S. (2005). Psi test feats achieved alone at home: Do they disappear under lab control? *Australian Journal of Parapsychology, 5*, 149–164.

Goretzki, M., Storm, L., & Thalbourne, M. A. (2014). Research note: Updating the Spiritual Emergency Scale. *Journal of Transpersonal Psychology, 14*, 240–244.

Hong, S. M., & Faedda, S. (1996). Refinement of the Hong Psychological Reactance Scale. *Educational and Psychological Measurement, 56*, 173–182.

Lawrence, T. R. (1993). Gathering in the sheep and goats: A meta-analysis of forced-choice sheep-goat ESP studies, 1947–1993. *Proceedings of the 36th Annual Convention of the Parapsychological Association* (pp. 75–86). Durham, NC: Parapsychological Association.

Lenzenweger, M. F., Clarkin, J. F., Kernberg, O. F., & Foelsch, P. A. (2001). The Inventory of Personality Organization: Psychometric properties, factorial composition, and criterion relations with affect, aggressive dyscontrol, psychosis proneness, and self-domains in a nonclinical sample. *Psychological Assessment, 13*(4), 577–591. doi:10.1037//1040-3590.13.4.577

Lovitts, B. E. (1981). The sheep-goat effect turned upside down. *Journal of Parapsychology, 45*, 293–309.

May, E. C. (2007). Advances in anomalous cognition analysis: A judge-free and accurate confidence-calling technique. In *Proceedings of the 50th Annual Convention of the Parapsychological Association* (pp. 31–47). Petaluma, CA: Parapsychological Association.

May, E. C., Faith, L. V., Blackman, M., Bourgeois, B., Kerr, N., & Woods, L. (2012). A target pool and database for anomalous cognition experiments. *Journal of the Society for Psychical Research, 76*, 94–103.

Palmer, J. (1971). Scoring in ESP tests as a function of belief in ESP: Part I. The sheep-goat effect. *Journal of the American Society for Psychical Research, 65*, 373–408.

Palmer, J. (1972). Scoring in ESP tests as a function of belief in ESP: Part II. Beyond the sheep-goat effect. *Journal of the American Society for Psychical Research, 66*, 1–25.

Palmer, J. (1977). Attitudes and personality traits in experimental ESP research. In B. B. Wolman (Ed.), *Handbook of Parapsychology* (pp. 175–201). New York: Van Nostrand Reinhold.

Schmeidler, G. R. (1945). Separating the sheep from the goats. *Journal of the American Society for Psychical Research, 39*, 47–49.

Schmidt, H. (1970). Quantum mechanical random number generator. *Journal of Applied Physics, 41*, 462–468.

Schmidt, H. (1992). Progress and problems in psychokinesis research. In B. Rubik (Ed.), *The interrelationship between mind and matter: Proceedings of a conference hosted by the Center for Frontier Studies* (pp. 39–55). Philadelphia, PA: Temple University.

Silvia, P. J. (2005). Deflecting reactance: The role of similarity in increasing compliance and reducing resistance. *Basic and Applied Social Psychology, 27*, 227–284.

Silvia, P. J. (2006). Reactance and the dynamics of disagreement: Multiple paths from threatened freedom. *European Journal of Social Psychology, 36*, 673–685.

Storm, L. (2016). Conformity and reactance in the *I Ching* using a Q-Sort/RNG-PK method: A pilot study. *Australian Journal of Parapsychology, 16*, 133–162.

Storm, L. (2019). Imagination and reactance in a psi task using the imagery cultivation model and a fuzzy set encoded target pool. *Journal of Scientific Exploration,* 33(2), 193–208.

Storm, L., Drinkwater, K., & Jinks, A. L. (2017). A question of belief: An analysis of item content in paranormal belief questionnaires. *Journal of Scientific Exploration, 31*(2), 187–230.

Storm, L., Ertel, S., & Rock, A. J. (2013). The sheep-goat effect as a matter of compliance vs. noncompliance: The effect of reactance in a forced-choice ball selection test. *Journal of Scientific Exploration, 27*(3), 393–411.

Storm, L., & Rock, A. J. (2014a). An investigation of the *I Ching* using the Q-Sort Method and an RNG-PK design: I. Four possible psi predictors. *Australian Journal of Parapsychology, 14*, 29–67.

Storm, L., & Rock, A. J. (2014b). An investigation of the *I Ching* using the Q-Sort Method and an RNG-PK design: II. The effect of reactance on psi. *Australian Journal of Parapsychology, 14*, 163–190.

Storm, L., & Tressoldi, P. E. (2017). Gathering in more sheep and goats: A meta-analysis of forced-choice sheep-goat studies, 1994–2015. *Journal of the Society for Psychical Research, 81*(2), 79–107.

Storm, L., Tressoldi, P. E., & Di Risio, L. (2010). Meta-analyses of ESP studies 1987–2008: Assessing the success of the forced-choice design in parapsychology. *Journal of Parapsychology, 76*, 243–273.

Thalbourne, M. A. (1995). Further studies of the measurement and correlates of belief in the paranormal. *Journal of the American Society for Psychical Research, 89*, 234–247.

Thalbourne, M. A. (2006). Kundalini and the output of a random number generator. *Journal of Parapsychology, 70*(2), 303–333.

Wiseman, R., & Schlitz, M. (1997). Experimenter effects and the remote detection of staring. *Journal of Parapsychology, 61*, 197–207.

West, D. J., & Fisk, G. W. (1953). A dual ESP experiment with clock cards. *Journal of the Society for Psychical Research, 37*, 185–189.

ACKNOWLEDGEMENTS