

# **The effect of group polarisation on perceived invulnerability in general aviation pilots**

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## **Abstract**

People who perceive themselves as relatively invulnerable to negative events may be more likely to engage in the kinds of behaviours that make the negative events more probable, while group polarisation refers to a tendency for groups to make decisions that are more extreme than those of individual group members. Accordingly, it was predicted that, following discussion, two pilots may experience greater levels of perceived invulnerability than either would when flying alone. Seventy-eight participants completed a measure of invulnerability whilst alone and then again following discussion with a peer. Contrary to expectation, invulnerability scores in pairs were significantly lower than those of participants alone. Participants who scored highest on perceived invulnerability whilst alone tended to show greater reductions in invulnerability when in pairs. The current findings suggest that groups of pilots may be less likely than lone pilots to be susceptible to perceived invulnerability.

## **Introduction**

People's perception of risk is often systematically inaccurate as they tend to believe that they are less likely to experience negative events than their peers (Weinstein, 1980). This phenomenon has been described as perceived invulnerability (Breheny & Stephens, 2004), unrealistic optimism (Weinstein, 1980) and an illusion of unique invulnerability (Burger & Burns, 1988), and has been observed to occur for events as disparate as contracting venereal disease, being injured in an automobile accident (Weinstein, 1980), failing in a business venture (Pinfold, 2001), or cardiovascular risk (Thompson & Ting, 2012).

Perceived invulnerability (PI) towards negative events (e.g., being involved in an accident or incident) amongst pilots is one of five hazardous attitudes to which pilots are frequently susceptible (Diehl, 1990; Galea, 2007). The Federal Aviation Authority (2002) argued that most General Aviation (GA) pilots believe they are safer, possess greater flying skill, are less likely to take risks in flight, and are less likely than their peers to experience an aircraft accident; that is, they perceive themselves as relatively invulnerable. For example, it has been reported that pilots generally believe that their chances of an accident are below average (Wichman & Ball, 1983), which is associated with the decision to continue on a simulated flight into deteriorating weather conditions (O'Hare & Smitheram, 1995). Similarly, pilots who fly into deteriorating weather are often overly optimistic about avoiding a weather-related accident or successfully flying out of the bad weather (Wilson & Fallshore, 2001), which is reportedly one of the most common causes of fatal accidents in GA (NTSB, 2005).

GA flying is often carried out by a single pilot, with the addition of a passenger who does not hold a pilot's licence (e.g., a friend), a passenger who also holds a pilot's licence or at least has some flying experience, or with a qualified flying instructor or flight examiner. When two people with knowledge of flying fly together, it is reasonable to assume that there will sometimes be discussion of aviation related topics, such as the aircraft's handling and performance, prevailing weather conditions, radio communications, spotting of landmarks and navigation.

A great deal of research has investigated how people's attitudes and beliefs may be influenced by the presence of others (Wood, 2000). For example, Buehler, Messervey and Griffin (2005) suggested that individuals in groups tend to be more optimistic than individuals alone, which may be explained through a process of group polarisation (Myers & Lamm, 1976). Isenberg (1986) explained that group polarisation "occur[s] when an initial tendency of individual group members toward a given direction is enhanced following group discussion" (p. 1141). In a meta-analysis of 22 separate studies, Isenberg (1986) found an effect size of  $r = .439$  attributable to the mere exposure to other group members who share similar views (and a much larger effect size,  $r = .746$ , following exposure to the persuasive arguments of other group members). More recent research has continued to confirm the effect of group polarization in areas such as climate change (Hart & Nisbet, 2012), political discourse (Sobkowicz & Sobkowicz, 2012) and jury decisions (Peoples, Sigillo, Green, & Miller, 2012).

As two or more people may be defined as a group (Mills, 1967), then two pilots in a GA aircraft who already perceive themselves as invulnerable (e.g., O'Hare, 1990) may together experience increased levels of invulnerability through a process of group polarisation. Consistent with extant theories of group polarisation and PI, it was predicted that when two pilots who believe themselves relatively invulnerable discuss the potential risk of a negative aviation event, their privately held beliefs about invulnerability will increase through a process of group polarisation.

## **Method**

### ***Participants***

Seventy-eight general aviation pilots were recruited from seven different flight training organisations in the North Island of New Zealand. There were 14 female and 64 male participants whose ages ranged from 18 to 59 years ( $M = 25.94$ ,  $SD = 7.86$ ); 10 (13%) were student pilots (pilots working towards a private pilot licence (PPL)), 33 (42%) held a PPL and 35 (45%) held a commercial pilot licence (CPL), of whom 31 held a flight instructor rating. The total flight experience of participants ranged from 30 minutes to 5,000 hours ( $Mean = 662.38$  hours,  $SD = 895.13$  hours).

### ***Design***

A repeated-measures experimental design was used, whereby all participants completed a 10-item measure of PI alone (control condition), during which they were unable to confer with any other participant, and an equivalent 10-item measure of PI in pairs, during which they discussed each question and answer with their peer before recording their own answers (experimental condition). The repeated-measures independent variable, designated as 'group', therefore had two levels (alone vs. pairs). The dependent variable was participants' scores on the measure of PI.

As both the control and experimental conditions were completed within a short period of time, it was deemed unviable to complete the exact same measure twice in quick succession as participants would likely remember their previous responses. Participants therefore completed two different measures of PI, designated as 'PI Scale A' and 'PI Scale B', in the control and experimental conditions. As the means of the two measures of PI almost certainly would not be exactly equivalent (because they would use different items), to control for differences between the means of the two measures, approximately half of the participants were randomly assigned to complete PI Scale A in the control condition, followed by PI Scale B in the experimental condition, whilst the remaining participants were randomly assigned to complete PI Scale B in the control condition, followed by PI Scale A in

the experimental condition. To avoid the possibility of any carry-over effects due to group polarisation, all participants completed the control condition first.

### *Materials*

The measure of PI used in the present study was based upon an 18-item measure developed by Gilbey, Fifield and Gibson (2006) to measure PI towards flight risks. This scale was initially designed to investigate levels of PI in student pilots, although it was also adapted to measure PI in air traffic controllers (see Gilbey, Fifield, & Rogers, 2006). To measure their level of PI, participants were asked to judge the likelihood of each of the 18 negative aviation events occurring to themselves, compared to pilots of a similar age and experience. For example, 'Compared to other pilots of similar age and experience, my chances of (negative aviation event) in the future are: almost certain; much above average; above average; a little below average; average for pilots with similar age and experience; a little below average; below average; much below average; never happen'. For the purpose of statistical analysis, the nine response options were assigned the numerical values 1 to 9, respectively. Thus, if there was no evidence of PI then the numerical score would be five, whereas a numerical score of higher than five would indicate the presence of PI and numerical score less than five would indicate that participants thought themselves more likely than average to experience the negative aviation event.

For the present study, two of Gilbey et al.'s (2006) items in the flight risk measure were deemed unsuitable for the potential participants in the present study; i) forgetting to select undercarriage up (as many participants would not have flown aircraft with retractable undercarriage) and ii) failing my medical (as it was not necessarily specific to aviation skills). The remaining 16-items were divided into two equivalent halves, designated as PI Scale A and PI Scale B, by allocating alternate items, in descending order of the effect size for a student pilot sample as reported by Gilbey et al. (2006). Four additional items were added, two to PI Scale A ('Misinterpreting an aerodrome chart or approach plate' and 'Omitting a checklist item') and two to PI Scale B ('Making a mistake on a flight plan' and 'Misunderstanding an ATC instruction'). The complete set of items in PI Scales A and B may be inspected in Table 1.

*Table 1.* List of items in PI scales A and B

Item	Scale A	Scale B
1	Embarrassing (e.g., wing-touch) incident whilst taxiing	Misinterpreting or failing to notice instrument readings
2	Unknowingly breaching controlled airspace	Completing a manoeuvre with inappropriate or wrong flap settings
3	Accidental controlled flight into terrain	Either fuel starvation or fuel exhaustion whilst flying due to poor fuel management
4	Unplanned heavy landing	Causing injury or death whilst flying
5	Misinterpreting an aerodrome chart or approach plate*	Being the cause of a near-miss
6	Descending too quickly, resulting in passenger discomfort	In flight engine failure
7	Getting lost whilst flying	Making a mistake on a flight plan*
8	Deviating from an assigned altitude	In flight bird strike
9	Unplanned stall	Taxiing to the wrong place
10	Omitting a checklist item*	Misunderstanding an ATC instruction*

\* Items not originally used by Gilbey, Fifield, & Gibson (2006)

### Procedure

An invitation to participate in the present study was sent to the chief flying instructors at 11 flight training organisations in the North Island of New Zealand. Participants were individually approached by the researcher (SYL) to complete the questionnaires alone, followed by being assigned in pairs as they were recruited and were immediately tested in a quiet room set aside for the purpose of the study.

*A priori* power analysis revealed that a sample size of  $n = 40$  would provide statistical power of at least  $\beta = .80$ , at  $\alpha = .05$ , assuming a moderate correlation ( $r = .50$ ) and a medium sized effect, when using a repeated measures ANOVA (two-tailed). The level of significance was  $p \leq .05$  and all tests conducted were two-tailed.

### Results

Internal consistency, Cronbach's Alpha, for PI Scales A and B was .899 and .835, respectively. There was strong evidence of a correlation between participants' total PI scores for subscales A and B,  $r = .624$ ,  $n = 78$ ,  $p < .001$  (Note:  $n = 40$  completed PI Scale A in the control condition and Scale B in the experimental condition whilst the remaining participants,  $n = 38$ , completed PI Scale B in the control condition and Scale A in the experimental condition). One-sample *t*-test (test value = 5) showed a highly significant effect of PI in both the control  $t(77) = 8.54$ ,  $p < 0.001$  (mean difference from test value = -1.06) and experimental conditions,  $t(77) = 8.92$ ,  $p < 0.001$  (mean difference from test value = -.94).

As the primary research question sought to test whether group polarisation causes an increase in the existing level of PI, the nine pairs of participants that contained at least one participant who did not exhibit PI (a score of  $< 5$  in the control condition) were excluded from all further analyses.

The association between PI scores in the control condition and the difference scores between the control condition and the experimental condition were conducted separately for participants who completed Scale A in the control condition and participants who completed scale B in the control condition. (The association was explored separately for the two groups in case there were systematic differences between Scales A and B.) There was significant evidence of a negative relationship between PI scores in the control condition and their corresponding difference scores (difference scores were calculated by subtracting participants' PI score in the control condition from their PI score in experimental condition) amongst those who completed PI Scale A in the control condition,  $r = -.613$ ,  $n = 34$ ,  $p < .001$ . A similar pattern of findings was observed for the participants who completed PI Scale B in the control condition,  $r = -.357$ ,  $n = 26$ ,  $p = .07$ , although this did not achieve statistical significance. This suggests that participants with higher levels of PI are likely to show lower levels of PI due to group polarisation whilst those with lower levels of PI are likely to show higher levels due to group polarisation.

To investigate this finding further, participants were divided ( $n = 60$ ) into two groups based upon a median split of their PI scores in the control condition (The closest to an equal median split was achieved by assigning participants scoring  $> 5.8$  ( $n = 27$ ) as high PI and those  $\leq 5.8$  ( $n = 33$ ) as low PI). A 2x2 mixed-design ANOVA provided evidence of a main effect of the within subject manipulation on PI,  $F(1, 58) = 5.24$ ,  $p = .026$  ( $M_{\text{Cont}} = 6.24$ ,  $SD = 1.03$ ,  $M_{\text{Exp}} = 6.01$ ,  $SD = .96$ ) and an interaction between manipulation (alone vs. pairs) and PI score in the control condition (low vs. high)  $F(1, 58) = 7.42$ ,  $p = .009$ . An interaction plot may be inspected in figure 1. (There was also a highly significant main effect of the median split on PI scores in the control condition  $F(1, 58) = 76.06$ ,  $p < .001$ ,  $M_{\text{low}} = 5.52$ ,  $SD = .34$ ,  $M_{\text{high}} = 6.86$ ,  $SD = .80$ ).

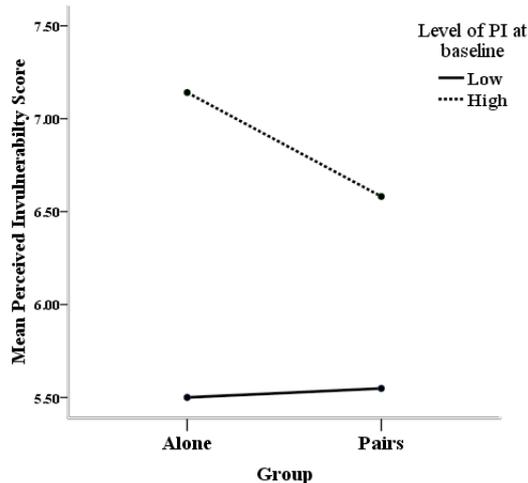


Figure 1. Plot of the interaction of group by low and high scores in the control condition.

## Discussion

Consistent with earlier research (e.g., O'Hare, 1990; FAA, 2002), strong evidence of PI towards negative aviation events was found for pilots in both the control and the experimental conditions. However, no evidence was found to support the experimental hypothesis that discussion between two pilots who alone exhibit PI towards negative aviation events will lead to an increased level of PI due to group polarisation. On the contrary, a decrease in levels of PI following group interaction and discussion was observed. Had the experimental hypothesis been supported, then there would have been cause for concern in dual pilot operations due to an increased level of PI. The actual findings suggest that PI may be less of a problem when there are two pilots than when there is only one pilot which, in principle, is a positive finding.

It would be interesting to examine whether the conclusion reached by the NTSB (2005), that led to them concluding that continuing with a flight when the wise decision may be to turn back was one of the most common causes of fatal accidents in general aviation, could be re-examined to explore the odds of this type of accident differed between lone pilots and pairs of pilots. Additionally, in light of the current findings, it may be interesting to attempt to replicate the studies conducted by Wilson & Fallshore (2001), O'Hare & Smitheram (1995) and Wichman & Ball (1983) with the inclusion of a between-subjects factor, alone vs. pairs.

Aside from what appear to be the applied implications of the current findings, it should not be overlooked that the findings of this study are, at least at face value, inconsistent with the wider body of literature in group polarisation (e.g., Isenberg, 1985; Hart & Nisbet, 2012; Sobkowitz & Sobkowitz, 2012; Peoples, et al., 2012). One possible explanation is that although people often perceive riskier decisions as corollaries of ability and skill (Jellison & Arkin, 1977), the majority of pilots will know that PI is a hazardous attitude (see FAA, 2002) and, therefore, in the company of other pilots a competing influence of social desirability may counter that of group polarisation and lead to decreased levels PI. However, as there was no reason to suspect that participants were aware that PI was being measured in the current study, this explanation seems unlikely.

Whilst further carefully designed research would be necessary to determine the extent to which the findings of the current study are robust, or whether under certain conditions they either do not occur

or are reversed, the current findings suggest the hazardous attitude of invulnerability (Diehl, 1990) may be less of a problem when two pilots fly together. The current findings also provide evidence of an intriguing exception to the theory of group polarisation, which may be of interest to social psychology researchers *per se*.

A potential limitation of the current study is that carry-over effects may have interacted with the version of the scale that was used in the control condition, although there are no *a priori* reasons to speculate why this would have occurred. As is often the case, another potential limitation arises from the use of non-probability sampling methods and therefore caution must be shown in making generalisations from the findings presented here to other populations. Finally, the current study involved the use of paper and pencil tests, from which PI scores were inferred. It is therefore possible that when flying for real, or even in a flight simulator study, a different pattern of findings may occur. In conclusion, the findings of the current study clearly suggest that in GA operations, PI may be less of a problem regarding aviation safety than in single pilot operations. Whilst this is a positive finding, more research is necessary to investigate whether this finding is indeed robust and if so, why a group polarisation effect did not occur in the current study.

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