**State Paranoia and Urban Cycling**

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**Abstract**

Consistent with a continuum approach to mental health, a growing body of research has established that paranoia occurs in the general population. The stress-vulnerability model would predict an association between environments high in threat and the presence of state paranoia, even in those with low dispositional trait paranoia. The present research examines whether urban cycling, a naturalistic environment high in interpersonal threat, is associated with state paranoia – operationalised as an explicit perception that other road users intend the agent harm. 323 members of the general population who regularly cycled in London completed measures of state and trait paranoia, anxiety, depression and stress. The majority of the general population sample (70%) reported experiencing state paranoia during urban cycling, and there was no association between state paranoia and trait paranoia. Reported state paranoia was higher during urban cycling than when using the London underground (a lower threat environment) and reported state paranoia on the underground was associated with trait paranoia. The findings are consistent with the stress-vulnerability model of everyday paranoia.

**Keywords:** paranoia; individual differences; health; emotion; cycling; urban environment

1. **Introduction**

Recent research has suggested that “ordinary individuals, in their everyday behaviour, manifest characteristics, such as self-centred thought, suspiciousness, assumptions of ill will or hostility, and even notions of conspiratorial intent, that are reminiscent of paranoia” (Fenigstein and Vanable, 1992, p. 130). A growing number of survey studies show that paranoia is indeed common in the general population (e.g., Ellett et al., 2003; Fenigstein and Vanable, 1992; Lincoln and Keller, 2008; Freeman et al., 2011). This finding is consistent with the idea that experiences such as clinical paranoia lie on continua functions with ordinary behaviour (Strauss, 1969). Ellett and colleagues (Ellett et al., 2003) first proposed an evolutionary account of ‘everyday’ (i.e. nonclinical) paranoia, proposing that a facility to suspect others of intending one harm was selected and distributed in humans due to its adaptive value in ancestral environments. An evolutionary perspective may also help elucidate why nonclinical (as well as clinical) paranoia can be persistent once actuated: There is clear adaptive value in remaining vigilant once a threat has been detected. In evolutionary terms, perceiving threatening stimuli or minimising the likelihood of missing a real threat could be adaptive (Preti and Cella, 2010) - a false positive (fearing harmless people) is potentially less costly than a false negative (failing to fear others who are truly hostile and therefore pose a genuine threat) (Cosmides, 1989; Cosmides and Tooby, 2005; Ermer et al., 2006).

Experimental research has begun to elucidate key current environmental factors that trigger paranoia – for example, showing that state paranoia is a response to a broken agreement from another person but not from a computer (Ellett et al., 2013). In nonclinical samples, state paranoia has been observed under conditions of induced high self-awareness plus task failure (Ellett and Chadwick, 2007), in virtual environments that lack an objective threat (Freeman et al., 2003), in response to social threat environments such as exclusion and loneliness (e.g. Kesting et al., 2013; Lamster et al., 2017), and in game theory environments (e.g. the Prisoner’s Dilemma Game, Ellett et al., 2013), that capture some of the key environmental qualities known to trigger paranoia, including threat and ambiguity. The stress-vulnerability model (Zubin and Spring, 1977), would predict that the relationship between state and trait paranoia would vary depending on the prevailing level of interpersonal threat in an environment. Vulnerability in this context is operationalised by degree of trait paranoia, such that when environmental threat is low, one would expect there to be a strong positive relationship between state and trait paranoia - there needs to be some trait disposition present (i.e. vulnerability) in order to interpret a low threat environment in a paranoid way. Evidence for this comes from studies using a virtual reality paradigm, in which the environment is necessarily neutral and lacks objective threat, and a positive correlation (r = 0.55) has been found between state and trait paranoia (Freeman et al., 2003).  However, as true environmental threat increases a stress-vulnerability model would predict that the association between trait and state paranoia would weaken, and that state paranoia would occur even in those with low trait disposition. Indeed, just has been demonstrated in the laboratory: for example, a combination of induced high self-awareness plus task failure reliably induces state paranoia in those with low as well as high trait paranoia (Ellett and Chadwick, 2007).

It might, however, be argued that laboratory manipulations of state paranoia lack a degree of ecological validity. In order to overcome this, researchers have started to assess state paranoia in real-world naturally occurring environments that contain threat of interpersonal harm – physical, psychological, or both. Two studies have found that exposure to an urban environment (a busy shopping street in London) increased state paranoia in individuals with persecutory delusions (Ellett et al., 2008; Freeman et al., 2015). However, research is yet to examine whether exposure to an urban environment has a similar toxic effect in nonclinical populations.

One naturally-occurring urban environment high in interpersonal threat is urban cycling. Tragically, the threat is all too real. In 2013, for example, six cyclists died within a fortnight on the roads of London; and more than 200 over a decade. The threat is also interpersonal, in that the fatalities and serious injuries typically occur following impact with drivers of motor vehicles. An experience of state paranoia whilst cycling in London would entail more than simply a recognition of risk of physical or psychological harm, with associated emotional and behavioural responses. To be classified as paranoia, there needs also to be a perception that other road users *intend* to cause harm to the agent (Freeman and Garety, 2000).

In the current study, we examine empirically for the first time if members of the general population report experiencing state paranoia during exposure to an urban environment, specifically whilst cycling in London. A multi-dimensional view of paranoia will be applied (Chadwick and Lowe, 1994; Strauss, 1969), and the study will also assess the degree to which reports of state paranoia when cycling correlate with trait paranoia, as assessed by the widely used Fenigstein and Vanable (1992) Paranoia Scale. Operationalising vulnerability in terms of trait paranoia, the hypotheses were first, that cyclists would report experiencing state paranoia whilst cycling, and second, given the high degree of environmental threat, state paranoia would not be correlated with trait paranoia. In order to explore further the potential applicability of the stress-vulnerability model, we also examined reported state paranoia when using a lower-threat mode of transport, the London underground (Tube). The Tube was chosen as a comparison because in virtual reality research it has been found not to trigger state paranoia in people low in trait paranoia (Freeman et al., 2003, 2008) and because it includes an interpersonal quality of sharing the space with others. Hypothesis 3 is that reported state paranoia will be significantly higher when cycling than when using the Tube, and hypothesis 4 is that there will be a significant positive correlation between trait paranoia and reported state paranoia when using the Tube (i.e. because in lower threat/stress environments state paranoia arises because of vulnerability expressed as trait paranoia).

**2. Method**

**2.1 Participants**

The inclusion criteria for the study were that participants were adults aged 18 years or over, and cycled regularly in London (self-reported frequency of at least once per week). Average self-reported length of journey was 34.5 minutes (range 7-120 minutes). A total of 323 members of the general population aged 18-66 (*Mage* = 33.2, *sd*= 11.24) participated; 58% were male.

**2.2 Measures**

***Paranoia Scale (Fenigstein and Vanable, 1992)*** is a trait measure of paranoia designed specifically for use with nonclinical populations. Participants rate their agreement with each of the 20 items on a scale of 1, “not at all applicable to me,” to 5, “extremely applicable to me.” The following aspects of paranoia are measured on this scale: the belief that other people or external powerful sources are trying to influence one’s behavior or thinking; the belief in a conspiracy, *i.e.*, that people are against the person in some way; the belief of being spied on and talked about behind one’s back; a general suspicion or mistrust of others; and feelings of resentment. Example items from the scale include: ‘someone has it in for me’; ‘I sometimes feel as if I am being followed’ and ‘I am bothered by people outside, in cars, in stores etc watching me’. Fenigstein and Vanable (1992) reported an overall alpha of 0.84 (*N* = 581 across four samples), implying good internal consistency. Alpha in the current sample was 0.86.

***State Paranoia Scale (SPS: Ellett et al., 2013)*** is a 4-item scale assessing state paranoia vis-a`-vis another person. For the purposes of the present study, participants were asked to rate how they perceive other people in cars, lorries and buses when they are cycling, or when using the tube, by marking responses on a 7-point scale anchored with two opposing statements. The four items are: (1) ‘‘friendly towards me’’ vs. ‘‘hostile towards me’’; (2) ‘‘Wants to please me’’ vs. ‘‘Wants to upset me’’; (3) ‘‘Wants to help me’’ vs. ‘‘Wants to harm me’’; and (4) ‘‘Respects me’’ vs. ‘‘Has it in for me’’. For all SPS items, the paranoid end of the scale contained both an explicit threat and malevolent intention. Items were scored so that high ratings indicate higher levels of state paranoia (possible range = 4-28). The SPS has been shown to have good internal consistency (Cronbach’s alpha=0.92), and alpha in the current sample was 0.85.

***Depression, Anxiety, Stress Scales-21(Lovibond and Lovibond, 1996)*** is a 21-item scale measuring depression, anxiety and stress during the preceding week. Each scale consists of 7 items rated on a 4-point Likert scale of frequency or severity (range 0-21 for each subscale). DASS-21 has been validated in a non-clinical population and was found to have good internal consistency (α =0.94 for depression and α =0.87 for anxiety).

**2.3 Procedure**

Ethical approval for the study was obtained from Royal Holloway, University of London. Participants were approached by email and were asked to complete an online survey about their experiences of cycling in London. All participants first read an information sheet summarising the broad aims of the project and gave online informed consent. All participants (*n*=323) completed the state paranoia scale whilst cycling followed by the trait Paranoia Scale. A subsample of participants completed the DASS (*n*=72) and the state paranoia scale whilst using the tube (*n*=134).

**2.4 Data Analysis**

We first present descriptive statistics for the state paranoia scale, and report (a) the number of participants endorsing each response category on the scale for each of the four items; (b) the proportion (*n* and *%*) of the total sample who provided a paranoid response (defined as endorsing ‘maybe’, ‘probably’ or ‘definitely’) for each item; and (c) an item level analysis of paranoid responses by participant. We then report mean scores on the state and trait paranoia measures and examine whether there were any gender differences. Correlational analyses were undertaken to examine relationships between state and trait paranoia, and anxiety, depression and stress. Finally, we examined whether there were differences in state paranoia when cycling compared to when using the tube.

**3. Results**

Table 1 shows the number of participants endorsing each response category for each of the four state paranoia items. Taking a conservative definition of presence of state paranoia as endorsing Maybe, Probably, or Definitely (i.e. excluding Unsure), the proportion of the total sample (*n*=323) evidencing state paranoia was as follows for each item: hostile towards me (*n*=187, 58%); wants to upset me (*n*=145, 45%); wants to harm me (*n*=95, 29%) and has it in for me (*n*=160, 50%).

*[Table 1 here please]*

As well as looking at state paranoia response by scale item, it is also informative to break down the data by participant. Defining presence of state paranoia as endorsement of the paranoid pole of an item with a response of Maybe, Probably or Definitely, yields the following profile: 94 participants endorsed no item; 54 participants endorsed one item; 54 participants endorsed two items; 51 participants endorsed three items; 68 participants endorsed all four items. Overall 227/323 (70%) of participants endorsed at least one item, evidencing state paranoia.

Mean state paranoia score whilst cycling was 17.35 (*sd* 4.3, range 7-28). There was no significant difference between males (*m*=16.7) and females (*m*=18.0) on the SPS (*t* = 1.55, *p*=0.12). Mean score on the Paranoia Scale was 29.31 (*sd* = 8.7, range = 20-60), which is lower than the mean (42.7) reported by Fenigstein and Vanable in their original validation of the scale (*t* = 14.79, *p* <.005), suggesting that the sample were low on trait paranoia.

Table 2 shows the correlation matrix for the study measures. Consistent with prediction, state paranoia whilst cycling was not associated with trait paranoia (*r* = 0.04, *p =* 0.7). The correlation coefficient is very close to zero, suggesting a negligible effect size. In addition, reported state paranoia whilst cycling was not associated with self-rated levels of anxiety, depression, or stress over the preceding week. Consistent with previous studies, trait paranoia was associated with self-reported levels of anxiety, depression and stress over the preceding week.

[*Table 2 here please*].

Finally, as predicted, total state paranoia (possible range 7-28) was significantly higher (*t*=7.02, *p*<0.0005) when cycling (*m*=17.4, *sd*=4.2) than when using the Tube (*m*=14.7, *sd*=3.5). Scores on each of the four individual state paranoia items were also significantly higher for cycling than when using the Tube (Hostile towards me: *t* = 6.57, *p*<.005; Wants to upset me: *t* = 4.80, *p*<0.005; Wants to harm me :*t* = 4.71, *p*<0.005; Has it in for me: *t* = 6.06, *p*<0.005). As predicted, trait Paranoia Scale scores were significantly correlated with state paranoia whilst using the Tube (*r*=0.3, *p*=0.002), but not when cycling (*r*=0.1, *p*=0.13).

**4. Discussion**

The present research explores the applicability of a stress-vulnerability framework to non-clinical paranoia, by examining the relationship between trait and state paranoia in two naturalistic environments of differing levels of threat – urban cycling and travelling on the London underground (Tube). The study first established the presence of state paranoia when cycling in London, an environment high in interpersonal threat: as predicted, state paranoia when cycling was common, with 227/323 (70%) participants endorsing at least one state paranoia scale item and 21% of participants endorsing all four state paranoia items. As one individual put it, ‘I honestly view every driver as if he’s trying to kill me’. Second, the study showed that levels of reported state paranoia were higher when cycling than when travelling by Tube, an environment that is lower in threat (though not without interpersonal threat). Third, the study found that the *relationship* between trait and state paranoia was different when urban cycling or travelling by Tube. Crucially, reported state paranoia when cycling was not correlated with trait paranoia – whereas in the lower-threat context of travelling by Tube, trait and state paranoia were positively correlated. Conceptualising trait paranoia as indicative of dispositional vulnerability, these findings are consistent with a stress-vulnerability perspective (Zubin and Spring, 1977) on non-clinical paranoia.

There are a number of limitations of the study that warrant consideration. In relation to the relevance of the stress-vulnerability framework, there are other pre-existing vulnerability factors (e.g. genetic, physiological) that might show a positive correlation with experiences of state paranoia when cycling. Also, the present research relied solely on survey methodology using self-report measures. Whilst paranoia – a meaning - is necessarily measured through self-report, future research on urban cycling might use physiological measures of stress to validate and extend subjective ratings of state paranoia, either in vivo, or in simulated environments. Again, generalisation beyond London cannot be assumed. Moreover, scores on the trait paranoia measure were lower in the current sample than a comparison norm, therefore the absence of a correlation between trait paranoia and state paranoia whilst cycling could be reflective of a floor effect. Finally, there remain important methodological issues concerning how best to measure (non-clinical) paranoia. One approach – the one adopted in the present study – is to include an explicit perception of malevolence in scale items (e.g. item 3, other road users “Want to harm me”). This explicit perception of malevolence offsets the risk of false positives, whereby simple fear or anxiety when urban cycling is misconstrued as paranoia. However, requiring an explicit perception of malevolence risks creating a dichotomous variable, whereas models of paranoia have long been rooted in continuum (Chadwick and Lowe, 1994).

The present research is a further demonstration of the commonality of paranoid thoughts in the general population. Why should this be? One possible explanation lies in an evolutionary account of paranoia, first proposed by Ellett et al. (2003) – namely, that paranoia is a behaviour that was selected because of its adaptive value in past ancestral environments. An evolutionary perspective on paranoia fits well with key dimensions such as fixity of paranoid beliefs, hyper-vigilance when stress is present, and a bias in favour of false positives (Preti and Cella, 2010). An evolutionary account may also help to normalise, or destigmatise, the word paranoia, and provide a wider context within which to understand paranoia as it manifests in psychopathological disorders. Certainly, normalising the presence of state paranoia during urban cycling is vital. Tragically the risk of harm by others is all too real when cycling in London, and the theoretical underpinnings of the present research seek explicitly *not* to pathologise state paranoia during urban cycling, but rather frame it as an ordinary and understandable response in environments characterised by high risk of physical or psychological harm.

Future research might usefully employ other methodologies, such as simulated virtual cycling environments, where threat severity can be more easily measured and manipulated, to allow further tests of the potential applicability of the stress-vulnerability model to state paranoia. Research might also explore if high levels of state paranoia increase safety when cycling in urban environments – and if so, is there an optimal level of state paranoia, beyond which it ceases to protect the agent and is even detrimental? Again, research might examine health benefits for urban cyclists of mindfulness training, a non-stigmatising skill that reduces stress whilst enhancing attentional control and has shown health benefits with clinical paranoia (Chadwick et al., 2005, 2009; Ellett, 2013). Lastly, future research might usefully determine whether findings generalise to other naturally occurring high threat environments – for example, work of the police, or armed forces.

The present research indicates that paranoia towards motor vehicle users may be common when cycling in London, and that far from being a pathological response, observed state paranoia is an understandable response to an urban environment containing significant and very real threat. The present findings reinforce and add a further dimension to the pressing public health need to focus on and protect urban cyclists.

**Table 1. Number of participants endorsing each state paranoia item whilst cycling (total *n* = 323)**

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Definitely | Probably | Maybe | Unsure | Maybe | Probably | Definitely |  |
| Friendly towards me | 4 | 31 | 53 | 46 | 97 | 62 | 28 | Hostile towards me |
| Wants to please me | 0 | 8 | 40 | 128 | 102 | 31 | 12 | Wants to upset me |
| Wants to help me | 1 | 22 | 73 | 130 | 63 | 23 | 9 | Wants to Harm me |
| Respects me | 6 | 40 | 58 | 58 | 94 | 45 | 21 | Has it in for me |

**Table 2.** Correlation matrix for study measures

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | 1 | 2 | 3 | 4 | 5 |
| State Paranoia whilst cycling | 1.00 |  |  |  |  |
| Trait Paranoia | 0.04 | 1.00 |  |  |  |
| Anxiety | 0.02 | 0.36\* | 1.00 |  |  |
| Depression | 0.13 | 0.40\* |  | 1.00 |  |
| Stress | 0.08 | 0.31\* |  |  | 1.00 |

\*Significant at *p*<0.01 level.

**Declarations**

**Ethical Standards**

The study was approved by the institutional ethics committee and has therefore been performed in according with the ethical standards laid down in the 1964 Declaration of Helsinki and its later amendments.

All persons gave their informed consent prior to their inclusion in the studies.

**Conflict of Interest**

The authors declare that they have no conflict of interest.

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