Psychological predictors of health anxiety and pain in ambulatory presentations in a hospital emergency department

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Abstract

Background: Health anxiety in attendees of out-patient medical clinics is well established; however, there has been a lack of research into health anxiety within emergency settings.
Aims: This study explored the prevalence of health anxiety in ambulatory presentations in a tertiary emergency department (ED) as well as the factors associated with pain and health anxiety in this setting.
Method: A cross-sectional questionnaire design was used to gather data from adult ED ambulatory attendees across a 4-day sampling period to assess psychological and physical health variables. Number of attendances to ED over the previous 12 months was accessed through healthcare records.
Results: Of the final sample ($n = 106$), 77% were white British, 54% were male, and 14% presented with severe health anxiety as measured by the Short Health Anxiety Inventory (≥ 18). Participants with pre-existing health conditions had significantly higher levels of health anxiety ($M = 12.36$, $SE = 1.59$) compared with those without ($M = 7.79$, $SE = 0.66$). Stepwise multiple regression analyses identified anxiety sensitivity and pain catastrophizing as significant independent predictors of health anxiety, explaining 51% of the variance in health anxiety. Pain catastrophizing was also a significant independent predictor of pain level, accounting for 20% of the variance.
Conclusion: This study provides insight into the prevalence of health anxiety in ED ambulatory presentations and key psychological predictors of health anxiety and pain. This has implications for treatment in an ED setting whereby patients may benefit from referral to medical psychology or mental health services.

Keywords: health anxiety; health services; pain; safety-seeking behaviours

Introduction

Health anxiety has been purported to be relevant to repeat and unnecessary attendance in the emergency department (ED; Daniels *et al.*, 2018). This is a common mental health difficulty seen across medical settings (Daniels *et al.*, 2020; Tyrer *et al.*, 2011) yet the rate of health anxiety within emergency settings such as the ED has not yet been established. With high rates of presentation of pain in the ED (Todd *et al.*, 2007) and elevated health anxiety seen in chronic pain and other chronic conditions (51.1%; Rode *et al.*, 2006; Tyrer *et al.*, 2011), it is likely that health anxiety is prevalent in an ED setting, particularly as those with chronic health problems are often high impact users.

ED clinicians may notice behaviours consistent with the cognitive behavioural model of health anxiety (Salkovskis and Warwick, 1986) whereby strategies such as reassurance

seeking provide only temporary relief from distress. This is particularly relevant given previous research suggesting that repeat attendance at the ED may represent a counter-productive 'safety-seeking behaviour' in health anxiety (Daniels *et al.*, 2018; Daniels and Sheils, 2017). Constructs such as pain catastrophization and anxiety sensitivity (fear of behaviour or physiological sensations associated with anxiety) are established key factors in the maintenance of distress in both health anxiety and pain, and may be relevant in the ED, with respect to recognition and understanding of distress.

Health anxiety in medical settings may provide a barrier to assessment and intervention and a reason for repeat attendance, despite being a condition that is highly responsive to treatment (Cooper *et al.*, 2017). Identification of psychological factors such as health anxiety and associated constructs in this population will increase our understanding of repeat attendance and potentially open avenues for targeted intervention. Indeed, a recent systematic review of psychological interventions in the ED were feasible and acceptable, with some evidence to indicate clinical effectiveness; amongst those included were studies treating health anxiety and non-cardiac chest pain (McGuire *et al.*, in submission).

This study therefore aims to identify whether health anxiety is prevalent in the ED where 80% of attendances are pain related (Todd *et al.*, 2007), and furthermore, seeks to establish whether the key psychological factors, anxiety sensitivity and pain catastrophizing, predict health anxiety and pain level in this setting. Given the known high prevalence of distress and psychological trauma in pain populations (Lumley *et al.*, 2022), these factors will also be examined and accounted for.

Method

Design and setting

The study implemented a cross-sectional questionnaire design with a convenience sample of walk-in patients accessing Southmead Hospital ED over a 4-day sampling period. Southmead Hospital is a Major Trauma Centre in Bristol, UK. The ED has an annual attendance of approximately 100,000 of which approximately 40% self-present via the waiting room. It is predominantly an adult ED with paediatric presentations managed in a nearby Children's Hospital.

Participants

Participants were all those attending the ED over the pre-specified sampling period who also met the following inclusion criteria: (a) aged 18 or over, (b) able to complete (or complete with assistance) a set of self-report questionnaires, (c) able to give informed consent, and (d) attending via the ED waiting room (only). Participants were excluded from taking part in the study if they were identified as requiring majors/resuscitation care by the triage nurse or there was insufficient data relating to their reason for ED attendance. Those attending via ambulance were excluded from the study as it was deemed inappropriate to administer a battery of questionnaires and consent forms to these patients when they were likely to be in distress or medically very unwell.

Procedure

Recruitment took place on the 15, 17, 18 and 21 July 2019 across four 8-hour daytime or early evening shifts. Participants were recruited at the ED reception desk after registration and brief clinical assessment by an ED nurse. Questionnaires were given to all patients who met eligibility criteria. Participants were asked to complete their questionnaires while waiting to be seen by a clinician and were invited to deposit their anonymized questionnaires to the return box provided on the desk.

Measures

Participants completed a battery of measures and a standard demographic questionnaire.

The Short Health Anxiety Inventory (SHAI; Salkovskis *et al.*, 2002) is a 14-item measure of health-related anxiety. Each item is scored from 0 to 3 with higher scores indicating higher levels of health anxiety and a score of ≥18 indicating severe health anxiety, consistent with previous studies (Daniels *et al.*, 2020). The SHAI has good internal consistency (α = .89; Salkovskis *et al.*, 2002).

The Patient Health Questionnaire-9 (PHQ-9; Kroenke *et al.*, 2001) is a 9-item measure of depressive symptoms scored from 0 to 3; higher scores indicate higher severity. The PHQ9 has good internal consistency (α = .89; Kroenke *et al.*, 2001). PHQ-9 score of ≥10 represent case level depression (Kroenke *et al.*, 2001).

The Generalized Anxiety Disorder-7 (GAD-7; Spitzer *et al.*, 2006) is a 7-item measure of anxiety symptoms scored identically to the PHQ-9, with good internal consistency (α = .92; Spitzer *et al.*, 2006). GAD-7 score of ≥8 represents case level anxiety (National Collaborating Centre for Mental Health, 2019).

The Adverse Childhood Experiences (ACE) Questionnaire (Felitti *et al.*, 1998) asks participants to indicate frequency of adverse childhood experiences, such as growing up in a household which featured domestic abuse, alcohol abuse or mental health problems, and was used in the present study as a measure of psychological trauma This study used the ACE Questionnaire which features a minor amendment in wording and scoring for UK participants (Bellis *et al.*, 2015; Ford *et al.*, 2016). Both UK and US scoring were used; these were nearly perfectly correlated (r_s = .99) and therefore the UK scoring only is reported. The ACE Questionnaire has demonstrated reliability (α = .78; Ford *et al.*, 2014).

The Pain Catastrophizing Scale (Sullivan *et al.*, 1995) asks participants to rate their agreement with 13 catastrophic statements about painful experiences. A score of 30 or higher indicates a clinical threshold for catastrophizing (Sullivan *et al.*, 1995). The scale has excellent internal consistency (α = .95; Osman *et al.*, 2000).

The Anxiety Sensitivity Index (Reiss *et al.*, 1986) is a 16-item measure of negative consequences of anxiety which has acceptable test–retest reliability (r = .75; Reiss *et al.*, 1986). A score of 25 or higher represents 'possible problems' warranting further investigation (Peterson and Plehn, 1999).

A visual analogue scale (VAS) was used for both current pain and anxiety level, with participants asked to record a number between 0 and 10. The VAS is a reliable measure used across populations and commonly used for pain in medical settings (Hjermstad *et al.*, 2011).

Healthcare records were also accessed for each consenting participant to determine number of ED attendances over the preceding 12 months. The GAD-7 and PHQ-9 were used as generic measures of psychological distress, commonly used across health settings.

Patient and public involvement (PPI) statement

Feedback on the questionnaire battery and burden of participation was sought from a PPI representative. Minor amendments arising from the feedback were made; for example, questionnaire titles were removed. The length of the questionnaires was deemed to be acceptable.

Statistical analysis plan

Statistical analyses were carried out using IBM Statistical Package for the Social Sciences (SPSS Statistics) 26.

To assess prevalence of health anxiety, a score of ≥18 was used as a cut-off for definite cases of health anxiety, replicating previous work in similar fields (Daniels *et al.*, 2020). Independent samples *t*-tests were planned to determine whether there was a statistically significant difference between health anxiety level for participants with pre-existing health conditions compared with those

without. Correlational analyses (Spearman's rho due to non-normality within the dataset) would test for associations between age and clinical variables, including anxiety VAS and GAD-7 for convergent validity, and associations with frequent attender status. A significance level of $p<.001$ was used for correlational analyses due to multiple comparisons.

A stepwise multiple regression analysis was planned to test whether pre-existing health conditions, anxiety sensitivity, history of adverse experiences, pain level, and pain catastrophizing were significant independent predictors of health anxiety. A second stepwise multiple regression with pain level as the outcome variable was also planned. In addition to the psychological variables of interest, the relevant demographic factors, age and reason for attendance, were entered into both regression analyses as control variables.

If 20% or fewer items were missing from questionnaires then the case mean substitution method was planned (Roth *et al.*, 1999). If more than 20% of the items were missing, then the measure for that participant was considered incomplete and excluded from analysis. Regarding the ACE Questionnaire, participants with any missing items were removed from the analysis ($n = 1$), as recommended. Outliers were screened for data entry error and retained in the dataset.

Results

Descriptive statistics

Of the 178 questionnaires distributed, 118 were returned (66.3%). Twelve participants were subsequently excluded due to insufficient consent ($n = 10$) and two further for insufficient data relating to reason for attendance reason ($n = 2$), resulting in a final sample size of 106 (59.6% of possible sample). The mean substitution method was used to impute scores for 22 cases.

Table 1 summarizes the participant demographic characteristics. Participants were primarily white British (77%, $n = 82$), 54% were male ($n = 56$), 54% were employed ($n = 57$), and 38% reported having a pre-existing medical condition ($n = 36$). The majority presented with minor injuries (65%, $n = 69$), with the rest presenting with a minor illness (35%, $n = 37$).

Means and standard deviations of clinical variables are displayed in Table 2. Approximately equal percentages of participants reached case level depression (22%, $n = 23$) and anxiety (22%, $n = 23$) as measured by the PHQ-9 (score of ≥ 10) and GAD-7 (score of ≥ 8), respectively. In relation to pre-existing medical conditions, 27% ($n = 26$) reported already having a physical health condition. These proportions reflect standard norms and are unremarkable. Despite this, only 3.2% of participants ($n = 3$) reported having a mental health condition; 7% of participants ($n = 7$) reported having both physical and mental health conditions.

Number of ACEs ranged from 0 to 8, with 19% ($n = 20$) of participants having experienced four or more ACEs. Using the anxiety VAS, nearly a third (32%, $n = 30$) reported anxiety reaching 5 out of 10 or higher, with 30% ($n = 28$) reporting no anxiety. In relation to pain VAS, 94% ($n = 90$) of participants reported some level of pain (rated as 1 out of 10 or higher), with 60% ($n = 58$) reporting pain reaching 5 out of 10 or higher. Pain as measured by the VAS was normally distributed, with skewness of -0.06 ($SE = 0.25$) and kurtosis of -0.74 ($SE = 0.49$).

Of those who completed the SHAI ($n = 100$), 14% ($n = 14$) reached threshold for severe health anxiety as indicated by a score of 18 or above. SHAI scores ranged from 0 to 32 ($Md = 8$, IQR = 4, 13). Reliability was calculated, resulting in Cronbach's $\alpha = .903$. Inspection of the histogram and skewness statistic (1.17, $SE = 0.24$) indicated that the SHAI data were highly positively skewed, with kurtosis of 1.10 ($SE = 0.48$).

Inferential statistics

Two separate *t*-tests (with 5000 bootstrapped samples and Welch's corrected degrees of freedom) showed significantly higher health anxiety for participants with pre-existing health conditions

Table 1. Participant demographic characteristics

		Responses (*n*)
White British, *n* (%)	82 (77.4%)	106
Any other White background, *n* (%)	9 (8.5%)	106
Black or British Black African, *n* (%)	5 (4.7%)	106
Asian or British Asian Indian, *n* (%)	4 (3.8%)	106
Asian or British Asian Chinese, *n* (%)	1 (0.9%)	106
Mixed White and Black Caribbean, *n* (%)	1 (0.9%)	106
Mixed White and Black African, *n* (%)	1 (0.9%)	106
Mixed White and Asian, *n* (%)	1 (0.9%)	106
Mixed any other mixed background, *n* (%)	2 (1.9%)	106
Employed full time, *n* (%)	57 (54%)	106
Age, *M* years (*SD*)	43.95 (17)	104
Male, *n* (%)	56 (54%)	104
ED attendances over last 12 months, *Mdn* (IQR = Q1, Q3)	1 (1, 2)	103
ED attendances over last 12 months (range)	1–5	103
SHAI, *n* (% severe health anxiety)	14 (14%)	100
SHAI, *Md* (IQR = Q1, Q3)	8 (4,13)	100
SHAI (range)	0 – 32	100
Pain level (VAS 0–10), *M* (*SD*)	4.88 (2.66)	96
Anxiety level (VAS 0–10), *M* (*SD*)	2.89 (2.87)	95
PHQ-9, *n* (% above case level)	23 (22%)	106
GAD-7, *n* (% above case level)	23 (22%)	105
ACE, *n* (% scoring 4 or more)	20 (19%)	104
Pre-existing physical or mental health conditions, *n* (%)	36 (38%)	94
Other services involved in care (apart from GP), *n* (%)	5 (7%)	75
Minor injury *n* (%)	69 (65%)	106
Minor illness *n* (%)	37 (35%)	106

Table 2. Correlational analyses (Spearman's rho) of clinical variables

	Age	Anxiety level	Pain level	SHAI	PHQ-9	GAD-7	ACE	Pain Catastrophizing Scale
Anxiety level	.09							
Pain level	.22	.29*	—					
SHAI	−.10	.41*	.16	—				
PHQ-9	−.15	.31*	.16	.46*	—			
GAD-7	−.16	.41*	.23	.57*	.67*	—		
ACE	−.33*	.11	.17	.12	.19	.24		
Pain Catastrophizing Scale	.07	.45*	.42*	.46*	.49*	.61*	.22	
Anxiety Sensitivity Index	−.07	.26	.20	.61*	.58*	.60*	.19	.65*

*p < .001; table reports Spearman's rho correlation coefficients.

($M = 12.36$, $SE = 1.59$) compared with those without ($M = 7.79$, $SE = 0.66$), 95% bootstrap CI [−7.98, −1.22], Welch's $t_{43.22} = -2.67$, $p = 0.01$, $d_z = -0.68$ but no significant difference in pain levels in patients with pre-existing health conditions ($M = 5.50$, $SE = 0.43$) compared to those without ($M = 4.60$, $SE = 0.37$): 95% bootstrap CI [−2.02, 0.20], Welch's $t_{74.42} = -1.56$, $p > .05$, $d_z = -0.35$.

Spearman's rho was performed due to non-normality of SHAI data. Significant relationships were identified between key variables (see Table 2). The moderate strength of the relationship between the anxiety VAS and GAD-7 indicated the measures assess similar but distinct constructs. This is attributed to the discrepancy between measurement of current anxiety (VAS) and anxiety over the preceding 2 weeks (GAD-7) which is likely to have been more variable; anxiety is also likely to be higher in a pre-diagnostic setting. Age was positively associated with trauma, but not any other variables. Strong associations were found in

Table 3. Stepwise multiple regression coefficients with health anxiety and pain level as dependent variables

Outcome	Variable	Model 1 Unstandardized coefficients Beta	SE Beta	CE Beta	Model 2 Unstandardized coefficients Beta	SE Beta	CE Beta
Health anxiety ($n = 80$)	Pain Catastrophizing	.40	.05	.67	.23	.07	.39
	Anxiety Sensitivity				.22	.07	.38
	R^2		.45			.51	
	F for change in R^2		63.01**			10.54*	
	f^2		.82			1.04	
Pain level ($n = 83$)	Pain Catastrophizing	.10	.02	.44			
	R^2		.20				
	F for change in R^2		19.56**				
	f^2		.25				

*$p < 0.01$; **$p < 0.001$. Health anxiety excluded variables: age, pre-existing conditions, pain level, attendance reason, ACE, PHQ-9, GAD-7. Pain level excluded variables: anxiety sensitivity, age, pre-existing conditions, attendance reason, ACE, PHQ-9, GAD-7.

expected directions, including anxiety and depression which co-occur, and anxiety sensitivity and pain catastrophizing which are conceptually linked.

Two separate stepwise multiple regressions were conducted to identify which key factors predicted health anxiety and pain in this setting; results of these regression analyses can be viewed in Table 3. There was no evidence of multicollinearity in either regression analysis.

First, considering the outcome variable health anxiety, results show that anxiety sensitivity and pain catastrophizing were significant independent predictors of health anxiety accounting for 51% of the variance explained; variables excluded from the model included age, pre-existing conditions, pain level, attendance reason, ACE, PHQ-9 and GAD-7.

Second, regarding the outcome variable pain level, results show that pain catastrophizing was the sole significant independent predictor of pain level accounting for 20% of the variance explained. Variables excluded from the model include anxiety sensitivity, age, pre-existing conditions, attendance reason, ACE, PHQ-9 and GAD-7.

Despite lower levels of recruitment that anticipated, performance of a *post-hoc* G*Power analysis indicated that both regression analyses were sufficiently powered to detect significant associations between variables ($n = 80$, $R^2 = 0.51$, effect size $f^2 = 1.04$, power $= 0.99$; $n = 83$, $R^2 = 0.20$, effect size $f^2 = 0.25$, power $= 0.89$, respectively), this suggests we can exercise confidence in these findings.

Discussion

This study aimed to determine the prevalence of health anxiety in an ED setting and identify key psychological factors that predicted health anxiety and pain in ED walk-in attendees. Findings indicate that 14% of ED walk-ins reported severe levels of health anxiety; this is similar to the levels seen in medical clinics (Tyrer *et al.*, 2011) but contrasts significantly with the rates of health anxiety observed in chronic pain settings which is around 50% (Rode *et al.*, 2006). In line with previous research, the present study also found that over 80% of patients presenting to the ED attend with pain (Todd *et al.*, 2007). This may be attributable to repeated use of strategic behaviours to resolve distress or symptoms (Salkovskis and Warwick, 1986) when experiencing chronic and unexplained pain; extended undiagnosed pain without amelioration or adequate explanation may increase the likelihood of symptom hypervigilance, fear avoidance, catastrophic thinking, and may inadvertently increase or maintain health-focused anxiety.

Indeed, those who are presenting with acute pain in this sample may be commencing their journey to chronicity. There is scope here to identify a highly distressing condition presenting in the ED and provide support to re-direct to medical psychology or mental health services, which may bear some impact on repeat attendance (Daniels and Sheils, 2017). This can be done using a brief screening measure such as the SHAI, which has now shown good reliability in this setting.

Consistent with the literature (Daniels *et al.*, 2020; Rode *et al.*, 2006; Tyrer *et al.*, 2011), participants with pre-existing health conditions reported significantly higher levels of health anxiety compared with those without any pre-existing health conditions. This suggests that those with pre-existing medical conditions may be more distressed in relation to their presenting health needs in the ED. Redirecting or targeting amelioration of health anxiety symptoms in this patient group could therefore be clinically beneficial, presenting as an opportunity to integrate physical and mental health interventions in existing community health services. However, as identified in this study, only a small minority of participants reported other services involved in their care – perhaps indicating a need to first facilitate access to these specialist community services, a strategy which could in turn help to reduce repeat ED attendances.

Stepwise multiple regression analyses identified that anxiety sensitivity and pain catastrophizing were significant independent predictors of health anxiety, accounting for over half of the variance in health anxiety. This is unsurprising given physiological changes detected within the body serve as both the primary sensory input and reinforcing behaviour which triggers common catastrophic misinterpretations of health stimuli in the health anxiety model. Pain catastrophizing was the sole significant independent predictor of pain; however, the proportion of variance accounted for was much less, at 20%. The relationship between pain catastrophizing and pain has been well documented (Osman *et al.*, 2000), and is consistent with the health anxiety model; evidently other factors are at play here.

These findings provide empirical support for the utility of the cognitive behavioural model of health anxiety (Salkovskis and Warwick, 1986) in the ED setting. Those with health anxiety are likely to detect changes in physical sensations, generate catastrophic interpretations related to the pain, experience distress and concern, and consequently employ safety-seeking behaviours (such as attend the ED) as an attempt to reduce distress/anxiety and resolve health concerns (Daniels and Sheils, 2017; Rode *et al.*, 2006). However, attending the ED is likely to elevate rather than ameliorate health anxiety in the long-term (Daniels and Sheils, 2017; Rode *et al.*, 2006). Yet, this short-term, immediate reduction of anxiety offered by medical reassurance is sufficiently powerful to perpetually reinforce ED attendance as a behavioural strategy to alleviate physical and emotional distress. Once identified, health-anxious patients attending the ED may benefit from appropriately addressing this issue in order to better meet need and reduce repeat attendance. Evidence supports the use of CBT for health anxiety in medical populations (Tyrer *et al.*, 2011), and the role of psychology in the ED (McGuire *et al.*, in submission).

Despite previous research and theoretical support for other constructs examined in this study, pre-existing health conditions and history of adverse experiences were not included in the health anxiety and pain final regression models. This was unexpected; it is noted that trauma was also not associated with either pain or health anxiety in correlational analysis. Trauma was associated with age, perhaps reflecting that with age you experience more trauma. This is a logical conclusion to draw; however, the direction of these relationships is hampered by the limitations of a correlational analysis.

Limitations

Due to the low rates of repeat attendance in the sample, the relationship between psychological variables and attendance could not be examined.

It is hypothesized that repeat attenders were not captured in this study as they may be less likely to participate due to common complex psychosocial circumstances, higher likelihood of

vulnerability and perceived a higher need for urgent care (Daniels *et al.*, 2018). Data reflect that frequent attenders have a higher propensity to attend during night shifts (Dr Foster 2018), which was not included in our sampling time frame. Future work should focus on capturing this using 24 hour sampling periods. It is noted that measuring health anxiety prior to a medical appointment may be perceived to risk artificially inflating rates of health anxiety; however, the SHAI is based on the previous 2 weeks, offering context outside ED attendance and mirrors methodology in similar studies in medical settings (Daniels *et al.*, 2020; Rode *et al.*, 2006; Seivewright *et al.*, 2004; Tyrer *et al.*, 2011), allowing comparison across groups.

This study is also limited due to collecting self-reported reason for attendance, meaning it was not possible to associate health anxiety with clinical diagnosis. Further research is therefore needed to better understand the relationship between clinical diagnosis and health anxiety in the ED.

Conclusion

The present study found that health anxiety was common in a convenience sample of ED walk-in patients, but further research must replicate these findings. Key psychological variables were associated with health anxiety and pain in this population, with findings offering valuable insight into the potential role of health anxiety in ED attendances and further empirical support for the utility of the cognitive behavioural model of health anxiety in medical settings. Screening for health anxiety in the ED may help to identify an unmet clinical need in patients who would benefit from a specialist referral to medical psychology or mental health services.

Data availability statement. Data are available on request.

Author contributions. **Hannah Parker:** Conceptualization (equal), Formal analysis (lead), Investigation (lead), Methodology (equal), Project administration (equal), Visualization (lead), Writing – original draft (lead), Writing – review & editing (equal); **Edward Carlton:** Conceptualization (equal), Methodology (equal), Supervision (supporting), Writing – review & editing (equal); **Sophie Harris:** Formal analysis (supporting), Project administration (equal), Visualization (supporting), Writing – original draft (supporting), Writing – review & editing (equal); **Jo Daniels:** Conceptualization (equal), Formal analysis (supporting), Methodology (lead), Supervision (lead), Writing – original draft (equal), Writing – review & editing (equal).

The initial concept of idea was developed J.D., H.P. and E.C. H.P. collected and performed the primary analysis of the data; further analysis was performed by S.H. and J.D. Specialist expertise regarding emergency medicine was provided by E.C., expertise on anxiety was provided by J.D. The manuscript presented here was written by H.P., S.H. and J.D., and edited by E.C. J.D. was the primary supervisor of H.P. and had oversight of the project. All listed authors reviewed the final submitted manuscript.

Conflict of interest. The authors declare none.

Ethical standards. Ethical approval was granted by the Department of Psychology Research Ethics Committee at the University of Bath (PREC reference number: 19-188). Local approval was obtained through North Bristol NHS Trust information governance processes. The authors have abided by the Ethical Principles of Psychologists and Code of Conduct as set out by the BABCP and BPS.

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