

Exploring characteristics in adult patients starting the RPAH Elimination Diet and Challenge Protocol: A qualitative study

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The research presented in this report was conducted by the candidate under the guidance of the supervisors that are mentioned above. I, Anna-Jane Debenham (the candidate) contributed to the study design, ethics modifications, measurement of dietary adherence, and the development of recruitment and data collection protocols. Together with students Imogen Hooper and Kristy-Lee Raso, we recruited patients and entered data manually and then analysed data independently.

Declaration:

'The candidate, Anna-Jane Debenham, hereby declares that none of the work presented in this paper has been submitted to any other university or institution for a higher degree and that to the best of her knowledge contains no material written or published by another person, except where due reference is made in the text'.

Anna-Jane Debenham

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Psychological factors may influence one's ability to adhere to the Royal Prince Alfred Hospital (RPAH) Elimination Diet and Challenge Protocol (ED&CP). This study aimed to determine the prevalence of anxiety, depression and eating disorders in patients attending the RPAH Allergy Unit, and evaluate the validity of the RPAH Allergy Unit Assessment Form (RAAF) in identifying these disorders. This was used to determine whether psychological factors influence dietary adherence to the RPAH ED&CP. Furthermore, this study sought to explore other personality traits, food beliefs and habits of patients and determine if these were indicative of one's ability to commence the RPAH ED&CP.

This study is part of a five-year cross-sectional study. A series of validated questionnaires were used to determine the psychological status of patients. Patients' four-day weighed food records on the RPAH ED&CP were used to determine any relationship between dietary adherence and psychological status. Demographic, social, personality and clinical information were collected via the RAAF to determine other personality traits of patients.

Means and standard deviations for anxiety, depression and eating disorders in patients ($n = 90$) prior to the RPAH ED&CP were 38 ± 12 , 10 ± 8 and 0.9 ± 1.0 , respectively. Of the patients who were assessed for dietary adherence ($n = 28$), 68 % were adherent, 14 % partially adherent and 18 % non-adherent and this did not appear to associate with psychological symptoms.

The distribution of depression, anxiety and eating disorders in patients prior to starting RPAH ED&CP was similar to the general adult population. No apparent relationship was evident between depression, anxiety and/or eating disorders and patients' dietary adherence. The RAAF may be useful for screening patients for depression.

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Abstract

Aim: Psychological factors may influence one's ability to adhere to the Royal Prince Alfred Hospital (RPAH) Elimination Diet and Challenge Protocol (ED&CP). This study aimed to determine the prevalence of anxiety, depression and eating disorders in patients attending the RPAH Allergy Unit, and evaluate the validity of the RPAH Allergy Unit Assessment Form (RAAF) in identifying these disorders. This was used to determine whether psychological factors influence dietary adherence to the RPAH ED&CP. Furthermore, this study sought to explore other personality traits, food beliefs and habits of patients and determine if these were indicative of one's ability to commence the RPAH ED&CP.

Methods: This study is part of a five-year cross-sectional study. A series of validated questionnaires were used to determine the psychological status of patients. Patients' four-day weighed food records on the RPAH ED&CP were used to determine any relationship between dietary adherence and psychological status. Demographic, social, personality and clinical information were collected via the RAAF to determine other personality traits of patients.

Results: Means and standard deviations for anxiety, depression and eating disorders in patients ($n = 90$) prior to the RPAH ED&CP were 38 ± 12 , 10 ± 8 and 0.9 ± 1.0 , respectively. Of the patients who were assessed for dietary adherence ($n = 28$), 68 % were adherent, 14 % partially adherent and 18 % non-adherent and this did not appear to associate with psychological symptoms.

Conclusion: The distribution of depression, anxiety and eating disorders in patients prior to starting RPAH ED&CP was similar to the general adult population. No apparent relationship was evident between depression, anxiety and/or eating disorders and patients' dietary adherence. The RAAF may be useful for screening patients for depression.

Key words: Dietary adherence, food intolerance, psychological symptoms, psychology questionnaires

Introduction

Food is an essential part of life, however for many people a range of unpleasant, uncomfortable and/or potentially fatal reactions can accompany it. Adverse food reactions can be immunological or non-immunologically mediated. Food allergies are one example of adverse food reactions and are caused by IgE mediated immunological responses,^{1,2} while food chemical intolerances are non-immunological reactions to food chemicals.³ These chemicals may be naturally occurring (salicylates, amines, glutamate) or artificially added (e.g. colourings, flavourings, preservatives). Gluten, dairy and soy can also cause non-immunological reactions in some people.² Food chemical intolerances can manifest as a variety of symptoms, including irritable bowel syndrome, headaches, migraines, fatigue, behavioural problems and urticaria.^{2,3} Reactions are dose dependent, and onset can be delayed hours to days after consumption.⁴

In Australia, the Royal Prince Alfred Hospital (RPAH) Elimination Diet and Challenge Protocol (ED&CP) is a reliable diagnostic tool for chemical food intolerance. It involves the elimination of all possible food chemical triggers, followed by assessment of symptom improvement, systematic chemical and food challenges and then diet liberalisation.^{2,3} There are three levels of dietary restriction; simple, moderate and strict. Patients are prescribed a level of dietary restriction based on; clinical patterns (frequency, severity), personal preference and their circumstances.³ Long-term management involves dietary modification based on challenge results, allowing the patient to keep the overall chemical intake below their threshold.³

Previous literature denotes higher rates in the incidence of psychological symptoms in patients prescribed restrictive diets.^{5,6,7} Studies looking at RPAH Allergy Unit patients however have found psychological symptoms to be comparable to that of the general population.⁸ As with most restrictive diets, many patients find adherence to the RPAH ED&CP challenging.^{9,10,11} When

considering dietary adherence of patients undergoing the RPAH ED&CP, the question arises whether psychological factors may play a role in influencing one's ability to adhere. In order to prescribe the most suitable level of dietary restriction for RPAH Allergy Unit patients and enhance the effectiveness of the RPAH ED&CP as a diagnostic tool, it is critical to investigate factors that might influence patient adherence.

Adherence to dietary advice is reported to be the lowest of all treatment types.¹² Evidence indicates non-adherence to treatment, be it dietary or medical, has a negative effect on treatment outcomes and quality of life (QoL) for the patient.^{13,14} Of rising concern is the impact of psychological status on dietary and medical adherence.^{9,13,14} Psychological conditions in patients with coeliac disease have been found to correlate with poorer gluten-free dietary adherence.¹⁰ Specifically, depression is thought to be one of the strongest predictors of patient non-adherence to medical treatment, with one review finding that depressed patients were three times more likely to be non-adherent to medical regimes than non-depressed patients.¹³ Research has also found a relationship between the presence of anxiety and eating disorders and reduced gluten-free dietary adherence.^{10,15} Screening for psychological conditions might subsequently identify possible non-adherence and therefore enhance clinician-patient relationship as well as diagnosis and treatment outcomes.

To improve patient adherence, determining the extent to which psychological conditions might influence adherence to the RPAH ED&CP is an important step forward. It is therefore necessary to determine the psychological nature of patients before they are prescribed the RPAH ED&CP using validated questionnaires.^{16,17,18} Currently the RPAH Allergy Unit Assessment Form (RAAF) is used to screen patients for anxiety, depression and eating disorders, however its validity has yet to be determined. Background patient information such as demographic, social, personality and QoL are also collected via the RAAF to further assist in determining the most suitable dietary plan for each patient. Past research has found that patients who exhibit psychological and personality disorders

are less likely to undergo the RPAH ED&CP.⁸ However for those patients with anxiety, depression or eating disorders who decide to proceed with the RPAH ED&CP, their dietary adherence has yet to be investigated.

This study first aimed to determine the distribution of depression, anxiety and eating disorders in RPAH Allergy Unit patients, and evaluate the validity of the RAAF in identifying these psychological symptoms. This was used to determine whether psychological factors influence dietary adherence in adults on the RPAH ED&CP. Furthermore, this study sought to explore other personality traits and determine if these are related to patients starting the RPAH ED&CP.

Methods

This study is part of a five-year prospective, observational study looking at nutritional adequacy and dietary compliance of patients prescribed the RPAH ED&CP. Data already obtained by past research students was used in the current study. A summary of the study protocol is shown in Appendix 1. Ethics approval was obtained from the Sydney Local Health District Human Research Ethics Committee (RPAH Zone).

Patient recruitment and data collection

Adult patients aged ≥ 16 booked for initial appointments at the RPAH Allergy Unit were contacted via telephone one week prior to their appointment to determine suitability for the study. Patients with suspected food related intolerance that had not previously been on the RPAH ED&CP, nor received education about the RPAH ED&CP, were suitable for inclusion in the study. Participation was voluntary.

Eligible patients who agreed to participate were sent the study information pack and instructions for completing a four-day weighed food record (WFR), to complete prior to their initial appointment. Recruited patients, who were recommended by their doctor to undergo the RPAH ED&CP, completed the RAAF as well as a series of validated questionnaires including, State-Trait Anxiety Index Y1-form (STAI), Beck Depression Inventory-ii (BDI-II), and Eating Disorder Examination Questionnaire (EDE)-Q, prior to seeing a dietitian. Consent to participate in the study was via submission of a completed four-day WFR and/or questionnaires. Patients were discontinued from the study if they did not see a dietitian for the RPAH ED&CP, chose to withdraw from the study or did not complete a four-day WFR or at least one psychological questionnaire. Patients who commenced the RPAH ED&CP were defined as ‘starters’ and those that chose not to commence or were lost to follow-up were defined as ‘non-starters’.

The RAAF is a self-reported form developed for patients with suspected food intolerance to complete at their initial appointment at RPAH Allergy Unit. The form gathers demographic, social, personality, QoL and clinical information. On the RAAF, patients self-report their anxiety, depression and eating disorder status as “current” and/or “past” or “never”.

The STAI consists of 40 self-administered questions for measuring state and trait anxiety.¹⁶ State anxiety (S-anxiety) measures the current state of anxiety and how respondents feel, whilst the trait anxiety (T-anxiety) measures anxiety ‘proneness’. To determine patients’ likelihood of having anxiety, STAI score norms for an adult population cut-offs >44 (mean + 1 SD) and <26 (mean – 1SD) for high and low likelihood of anxiety respectively, were used. The STAI is a reliable and valid tool, however S-anxiety is more susceptible to external confounders such as physical environment, while T-anxiety can be confounded with measures of depression.¹⁶

The BDI-II is a 21-item self-report tool to screen for depression.¹⁷ Patients choose from one of four statements that best describe the way they have been feeling during the past two weeks. A BDI-II score < 10 provides a conservative cut-off, below which patients are unlikely to have clinical depression. Patients' answers to seven specific BDI-II questions form a BDI-Primary Care (BDI-PC) score. A BDI-PC score > 5 yields maximum clinical efficiency, high specificity, and provides a cut-off above which patients are likely to have clinical depression.¹⁹ BDI-PC scores were used to determine those likely of having depression, as it is highly accurate and minimises exaggerated scoring from medically related problems.¹⁹

The EDE-Q is 28-item questionnaire that assesses the psychopathology of eating disorders from the previous 28 days.¹⁸ A global score ≥ 2.3 and the presence of either binge eating or compulsive exercise as a means of weight control, are used to classify patients at high risk of having an eating disorder. This criteria yields optimal validity, increases specificity and has good psychometric strength in a general population.²⁰ RPAH Allergy Unit staff measured and recorded patients' weight and stature.

Patients were asked to complete a second four-day WFR after three weeks on the RPAH ED&CP. At three months following their initial appointment, patients were then asked to complete a second RAAF. Additional information was collected from the RPAH Allergy Unit electronic database including patient demographics. Dietary adherence was assessed in patients who had completed a four-day WFR whilst on the RPAH ED&CP and at least one psychological questionnaire from the initial appointment. Adherence in this respect can be defined as the extent to which patients followed the instructions of their doctors and dietitians. Patients were classified as 'adherent', if they consumed only the foods recommended on their prescribed diet, 'partially adherent' if they consumed less than three foods that deviated from their prescribed diet or 'non-adherent' if they ate non-prescribed foods on more than two occasions.

Data Analysis

Data was entered and analysed using Microsoft Excel, FoodWorks7 (Professional Version 7, Xyris software, Brisbane, Australia) and Prism (Version 6, GraphPad Software). Descriptive statistics were calculated for various population groups, however, due to the small sample size statistical analyses could not be conducted.

Results

Study population

Contact was attempted with patients ($n = 328$) one week prior to their initial appointment, of these 67% (222/328) were contactable by telephone, 48% (107/222) of which were eligible for the study and received further information. At the initial appointment, 50% (54/107) of patients agreed to remain in the study, 76% (41/54) of which saw a dietitian for the RPAH ED&CP and completed the RAAF and at least one psychological questionnaire. A further 49 patients were included for analysis from previous and interim studies, however the RAAF was not completed by patients from 2013 as it was not part of the study protocol at that time.

Incidence of psychological symptoms

Validated psychological questionnaires were completed by 90 individuals (mean age = 42; SD 14; 79% females), with 88, 76, 82 and 71 patients completing the STAI-S, STAI-T, BDI-II and EDE-Q respectively. Mean \pm SD scores were 37 ± 12 , 38 ± 11 , 10 ± 8.0 and 0.9 ± 1.0 for STAI-S, STAI-T, BDI-II and EDE-Q respectively. Of those that completed STAI, BDI-PC and EDE-Q, 25% (19/76) were classified as a high likelihood of having anxiety, 11% (9/82) had a high risk of clinical depression and 5/71 (7 %) met the criteria for a high risk of an eating disorder.

Correlation between psychological symptoms and dietary adherence

Twenty-eight patients met the criteria for determining dietary adherence, of which 68% (19/28) were adherent, 14% (4/28) partially adherent and 1% (5/28) non-adherent. No relationship could be identified between patients' psychological symptoms and their adherence to the RPAH ED&CP (Table 1.)

Table 1. Relationship between psychological symptoms and adherence to the RPAH Elimination Diet and Challenge Protocol in RPAH Allergy Unit patients ($n=28$).

Psychological Symptoms	Adherent ($n = 19$)	Partially Adherent ($n = 4$)	Non-adherent ($n = 5$)
None (%)	63	50	100
Anxiety (%)	11	0	0
Anxiety + Depression (%)	26	50	0

Validity of RAAF in identifying psychological symptoms

The mean STAI, EDE-Q, BDI-II and BDI-PC scores were higher for patients that self-reported having "current" anxiety, eating disorder or depression respectively, than for patients who reported "never" having had these psychological symptoms (Figure 1a). For anxiety, there were 38 scores above the threshold for high likelihood of having anxiety for either S-anxiety or T-anxiety, of which 20 reported "current" anxiety, six "past" anxiety and 12 "never" having suffered from anxiety respectively on the RAAF form (Figure 1a). Additionally, 50% (20/40) of patients who self-reported "current" anxiety on the RAAF, scored below the cut-off for high likelihood of anxiety. For eating disorders, there were six patients who scored above the threshold on the EDE-Q, of which three met the additional criteria for being at high risk of having an eating disorder (Figure 1b). Of these three, one reported having had an eating disorder in the past and two "never" having suffered from an eating disorder on the RAAF. The only person to report having a "current" eating disorder on the RAAF had a score below the threshold on the EDE-Q. For depression, six people scored above the threshold of having a high likelihood of depression on the BDI-PC, of which four

reported “current” depression, one “past” depression and one “never” having suffered from depression on the RAAF (Figure 1d). Additionally, 64 % (7/11) of people who reported “current” depression on the RAAF were below the threshold on the BDI-PC (Figure 1b). See Appendix 3 for further results on the validity of the RAAF.

Personality traits affecting whether patients start the RPAH ED&CP

The working status, education, previous dietary attempts and frequency of eating out of patients that started or did not start the RPAH ED&CP are given in Table 1. Non-starters scored higher in variety seeking questions such as “enjoying making new dishes”, food and pleasure related questions such as “enjoying food is one of the most important pleasures in my life”, natural food preference related questions such as “I think organic foods are better/taste better than commercially grown/processed foods” and extraversion related questions for example “is out going, sociable” (Figure 2a, 2b). Starters scored higher in questions relating to ‘open-mindedness’ for example, “has an active, artistic imagination” and time and energy saving questions such as “the less physical energy I need to prepare a meal, the better” (Figure 2a, 2b).

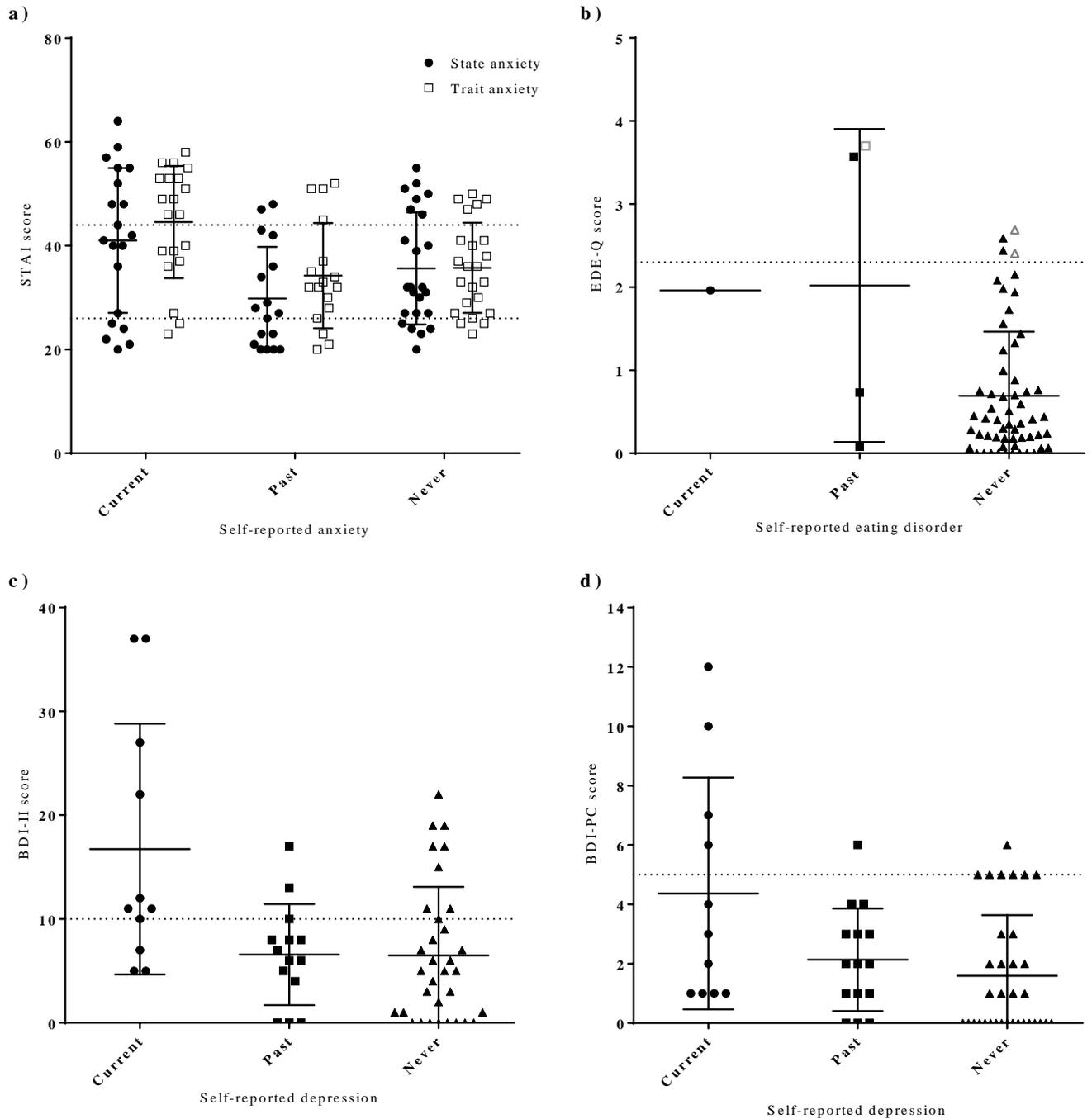


Figure 1. Self-reported RAAF psychological status compared to psychological questionnaire scores (mean \pm SD). (a) Self-reported anxiety versus State and Trait Anxiety Inventory (STAI) scores. Y-axis lines show cut-off at 26 and 44 for low and high likelihood of high anxiety, respectively. (b) Self-reported eating disorder versus Eating Disorder Examination Questionnaire (EDE-Q) score. Y-axis line at 2.3 shows cut-off for part of the criteria for high risk of having an eating disorder. Unfilled data points (Δ) represent patients meeting the full criteria for a high risk of having an eating disorder. (c) Self-reported depression versus Beck Depression Inventory-ii (BDI-II) score. Y-axis at 10 shows cut-off below which patients have a low likelihood of depression. (d) Self-reported depression versus Beck Depression Inventory-Primary Care score. Y-axis line at 5 shows cut-off, above which patients have a high likelihood of depression.

Table 1. Self-reported patient information from the RPAH Allergy Unit Assessment Form and its relationship to starting or not starting the RPAH Elimination Diet and Challenge Protocol.

	Starters (n = 61)	Non-starters (n = 21)
Working status (%)	Working: 65% Not working: 35%	Working: 57% Not working: 43%
Education (%)	Secondary school: 7% Trade/tech training: 19% University: 71% Other: 5%	Secondary school: 21% Trade/tech training: 16% University: 53% Other: 11%
Mean number diet attempts prior to RPAH Allergy Unit	2.1	2.4
Eating out frequency (daily/weekly/monthly/occasionally/never)	Monthly to occasionally	Weekly to monthly

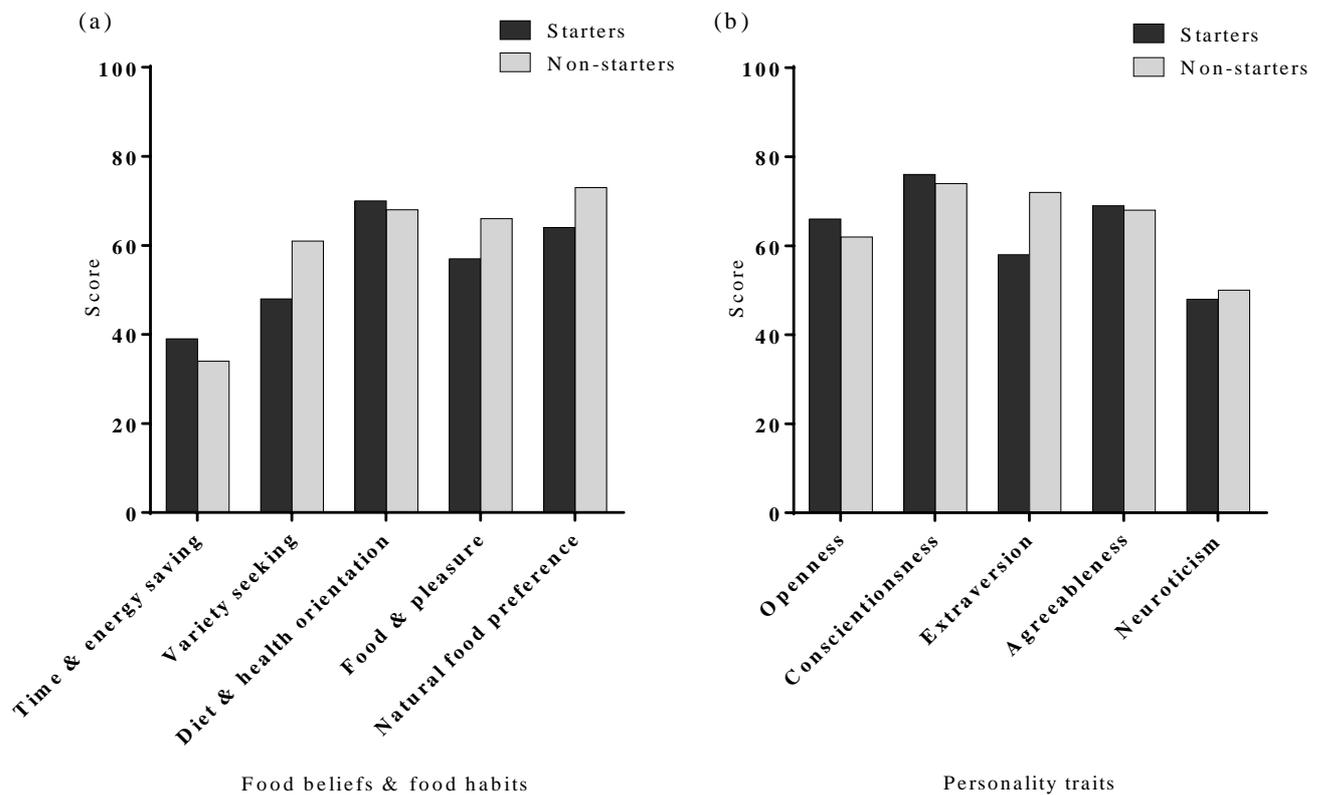


Figure 2. Mean scoring for RAAF questions relating to food beliefs, food habits and personality questions, in patients who started the RPAH Elimination Diet and Challenge Protocol ‘starters’ ($n=61$) and those that did not start, ‘non-starter’ ($n=22$). (a) Mean scores for food beliefs and habits questions. (b) Mean scores for personality questions.

Discussion

The present study aimed to determine the distribution of depression, anxiety and eating disorders in RPAH Allergy Unit patients before being prescribed the ED&CP, and identify whether this influenced patients' adherence to this prescribed diet. The results indicate that the means and standard deviations (SD) for anxiety, depression and eating disorders (38 ± 12 , 10 ± 8 and 0.9 ± 1.0 , respectively) are analogous to that of the normal adult population for anxiety, depression and eating disorders (35 ± 10 , 12.5 ± 9.9 and 0.93 ± 0.86 , respectively)^{16,17,18,21,22} and further, that this did not appear to affect dietary adherence. The present study also sought to validate the RAAF as a screening tool for anxiety, depression and eating disorders. Findings suggest that ability of the RAAF may be effective at screening for depression but not for eating disorders or anxiety.

The distribution of psychological symptoms, as defined by mean STAI, EDE-Q and BDI-PC scores and SD in this group of patients, was similar to published values for the normal adult population.^{16,17,22} Previous literature revealed a heightened incidence of psychological symptoms in patients on restrictive diets such as gluten-free diets or diabetic diets.^{6,7,23} Further patients need to be recruited as the small population size of the current study may be insufficient to detect such a relationship.

This study found no clear relationship between dietary adherence to the RPAH ED&CP and psychological symptoms. This contrasts with previous research where a heightened prevalence of depression, anxiety and eating disorders has been correlated with poorer gluten free dietary adherence.^{10,15} Patients who exhibit psychological and personality disorders are less likely to enrol in the RPAH ED&CP.⁸ This suggests that patients with psychological symptoms who do not have the aptitude to continue on the RPAH ED&CP are likely to drop out prior to enrolment, meaning

those that do enrol may have the capability or motivation to adhere to their diet, despite certain psychological symptoms.

The validity of the RAAF and its ability to screen patients for anxiety, depression and eating disorders varied according to psychological disorder of interest. Patients' self-reported anxiety status compared to their STAI scores appeared to be the most discordant. All patients who answered "current" on the RAAF but scored below the cut-off for low likelihood of anxiety had higher T-anxiety scores than S-anxiety scores, indicating they may have been feeling less anxious on the day they attended the clinic, compared to usual (Figure 1a). Patients who denied having anxiety but scored above the cut-off, appeared to have symptoms that people with anxiety experience but also coincide with possible indicators of general feelings of depression e.g. feeling unsatisfied, not rested and not content (Appendix 3).²⁴

As only one patient reported having a "current" eating disorder, it was not possible to evaluate if there was a relationship between the RAAF and EDE-Q (Figure 1b). Given that two of three patients identified as being at high risk of having an eating disorder, reported "never" having had one on the RAAF, it did not appear to be a reliable means of identifying eating disorders like anorexia nervosa or bulimia. These two patients scored highest to questions relating to shape and figure concern and whilst such concerns are commonly seen in patients with eating disorders, they are also often seen in overweight people trying to lose weight in a non-disordered way. Interestingly, these patients' BMIs fell in obese class 1 and class II categories, suggesting their weight loss concerns may not necessarily be related to disordered eating (Appendix 3). One patient answered "current" to having an eating disorder however scored slightly below the cut-off. This patient scored highest to shape and weight concern, however zero for eating concern and had a BMI of 31 (obese class I), potentially indicating misinterpretation of the RAAF form (Appendix 3).

Patients' self-reported depression status appeared associated with their BDI-PC scores, with 66 % (4/6) of those scoring above the threshold reporting "current" depression. Seven patients who self-reported "current" depression scored below the cut-off for low likelihood of depression for their BDI-PC score, compared to three patients who answered "current" and scored below the cut-off for their BDI-II score (Figure 1c, 1d). These findings indicate patients' depressive symptoms may be specifically related to their current state of physical illness, as when looking at BDI-PC scores, which minimises medically related depressive symptoms, more patients fall under the cut-off. One patient self-reported "never", however scored just above the cut-off. This patient reported feelings of sadness, past failure and loss of pleasure, indicating that they did not see these symptoms as indicating depression (Appendix 3). One patient self-reported "past" for both depression and anxiety however for both questionnaires scored above the cut-offs. This is most likely indicative of the patient feeling much better than in the past when diagnosed with depression and anxiety. These results support previous literature that self-reported measurements of depression may be an effective way to screen for depression.²⁵

Understanding the characteristics and personality traits of patients who present to the RPAH Allergy Unit is important in determining the most appropriate dietary approach for each individual. Overall, our results indicate patients who did not start the diet were more extroverted, food-loving people, who enjoy cooking and experimenting with new dishes, compared to those who started the diet (Figure 2a, 2b). Starters scored higher in open-mindedness, suggesting they are more likely to try new things. Starters also scored higher in time and energy saving, which would be expected, by the fact that a greater proportion of them are working full-time (Table 1). On average, patients who go on the RPAH ED&CP had higher education levels than those that did not. Such results may help in understanding why patients may choose not to commence the diet, and help doctors and dietitians tailor their advice to take into account patients' personality traits. Non-starters on average had attempted slightly more diets before coming to the RPAH Allergy Unit, compared to starters,

suggesting non-starters may need more motivation and support to start the RPAH ED&CP. Non-starters on average self-reported eating out more frequently than starters, indicating they may experience more difficulty adhering to the diet or be hesitant to commence due to the dietary restrictions imposed, making eating out difficult.

There are a number of potential sources of error that should be considered when interpreting the findings from the current study. The major limitation of this study was the small sample size. The sensitivity of identifying a correlation between psychological symptoms and dietary adherence was reduced as the results may not be representative of the target population. More patients are required before statistical analyses can be made and definite conclusions drawn. Sampling methods used in the present experiment may additionally bias results, for example patients who do not adhere to dietary restrictions may be less likely to return questionnaires or consent to the study. Given participation is voluntary, this likely favoured literate individuals, who are interested in the study, potentially explaining why starters had a higher proportion of individuals working, with university qualifications. Another potential limitation is the time point at which adherence was actually measured. Measuring dietary adherence three weeks after starting the RPAH ED&CP might be too soon a time point, as whilst most patients notice a change in symptoms in the first two to four weeks of being on the diet, some patients can take six to eight weeks for symptoms to resolve. Therefore it may take some patients more than three weeks to adjust to the RPAH ED&CP in terms of altering their recipes and eating patterns. For this reason, future studies should explore the possibility of measuring dietary adherence at another time point. Past research has demonstrated that expert evaluations of dietary adherence is one of the most effective ways of determining adherence,⁵ therefore, future studies should look at measuring adherence in a different manner such as dietitian evaluation via a patient interview.

Conclusion

This study found a similar distribution of depression, anxiety and eating disorders in patients presenting to the RPAH Allergy Unit for the RPAH ED&CP to the general adult population. No apparent relationship was evident between depression, anxiety and/or eating disorders and patients' dietary adherence. The RAAF may be useful for screening patients for depression, however requires further validation with a larger sample size. Personality traits and characteristics of patients presenting to the RPAH Allergy Unit should help doctors and dietitians tailor their advice and be incorporated into individualised management plans for each patient. Future research should focus on examining dietary adherence and psychological factors in a larger population group. Furthermore, it would be interesting to investigate the impact of psychological symptoms on long-term dietary adherence e.g. at 12 months. Another research opportunity could be to examine the nutritional adequacy of a patient's diet and compare this to psychological symptoms and dietary adherence, as this may provide useful information on the repercussions of poor dietary compliance.

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Conflict of interest

There is no conflict of interest to report

Authorship

Anna-Jane Debenham was the primary author and was involved in patient recruitment, data collection, entry and analysis and writing the manuscript. Imogen Hooper and Krist-Lee Raso contributed to recruitment, data collection and data entry. Dr Robert Loblay, Dr Anne Swain, Brooke Mckinnon, Carling Chan and Kirsty Le Ray were responsible for study design and supervision.

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Appendix 1.

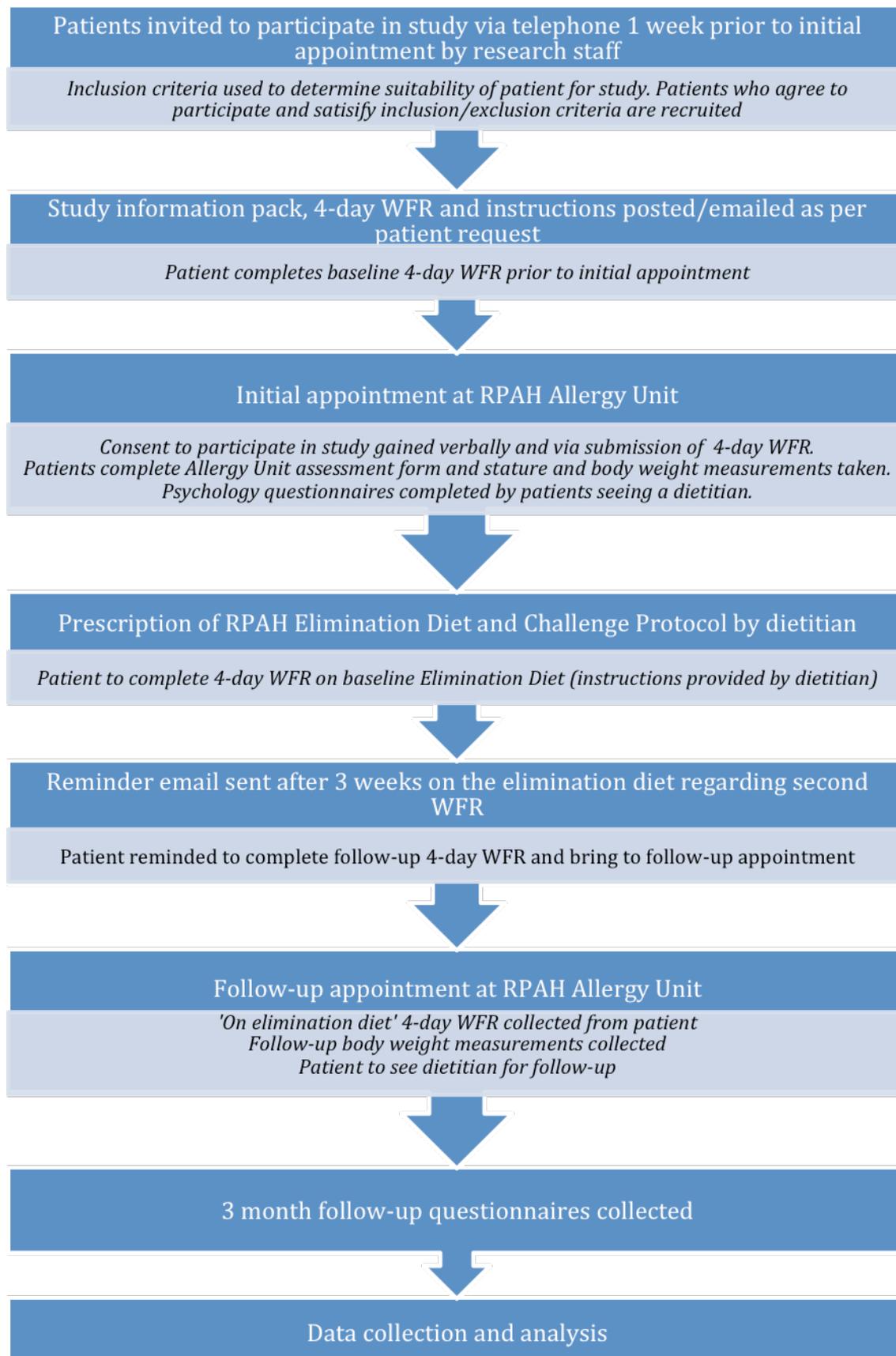


Figure 1. Study protocol used for patient recruitment, data collection and analysis.

Appendix 2. Dietary adherence verses psychological symptoms

Table 1 Percentage (%) of patients classified as high risk of anxiety, depression or an eating disorder (as per STAI, BDI-II, EDE-Q, respectively), grouped according to dietary adherence to the RPAH Elimination Diet and Challenge Protocol ($n = 28$).

Adherent (%) ($n=19$)		Partial (%) ($n=4$)		Non-adherent (%) ($n=5$)	
x A x D x E	63%	x A x D x E	50%	x A x D x E	100%
✓A	11%	✓A	0%	✓A	0%
✓D	0%	✓D	0%	✓D	0%
✓A ✓D	26%	✓A ✓D	50%	✓A ✓D	0%
✓A ✓D ✓E	0%	✓A ✓D ✓E	0%	✓A ✓D ✓E	0%
✓E	0%	✓E	0%	✓E	0%

$xA xD xE$ = no anxiety/depression/eating disorder; ✓A = anxiety only; ✓D = depression only; ✓A ✓D = anxiety and depression; ✓A ✓D ✓E = anxiety, depression and eating disorder; ✓E = eating disorder only.

Appendix 3. Additional information to assess the validity of the RPAH Allergy Unit Form compared to validated psychological questionnaires.

STAI verses self-reported anxiety

Of the STAI scores below the cut-off for a low likelihood of high anxiety 7/25 (28%) were from patients who answered “current” and all of these patients had higher T-anxiety scores than S-anxiety scores (Figure 1a). STAI state questions for which these patients scored highest were “I feel... calm, secure, at ease”, STAI trait statements for which these patients scored highest were “I feel...nervous, restless”, “I do not feel... comfortable, rested”. Of the STAI scores that were above the cut-off for a high likelihood of anxiety, 12/38 were from patients who answered “never”. STAI statements for which these people scored highest “I am tense”, “I do not feel... satisfied, content, rested”.

EDE-Q verses self-reported eating disorders

One patient answered “current” to having an eating disorder and scored below the cut-off (Figure 1b). This patient scored highest to questions relating to shape and weight concern; “feeling fat”,

“having a desire to lose weight”, and scored zero in the eating concern questions. The BMI for this patient was 31 (Obese Class I). One patient who answered “past” to having “anorexia nervosa”, met the EDE-Q score criteria for a high risk of having an eating disorder and scored high in relation to weight and shape concern and moderate in relation to eating concern questions. This patient reported “deliberately trying to limit/exclude the amount of food to influence shape or weight”, and “strong desire to... have a flat stomach/lose weight” as well as “feeling fat”. BMI for this patient was 26 (overweight). Two patients, who answered “never” and scored above the cut-off, met the EDE-Q score criteria for a high risk of having an eating disorder. These patients scored highest to questions relating to “feeling guilty eating because of effects on shape/weight”, “dissatisfied with weight and shape”. These patients had BMIs of 32.7 and 36.7 (Obese Class I and II, respectively).

BDI-II verses self-reported depression

Of the patients who answered “current”, 7/11 scored below the cut-off and scored highest to questions relating to feelings of sadness, loss of pleasure and self-criticalness. One patient answered “never” and scored above the cut-off. BDI-PC questions for which this person scored highest were “lost confidence in myself”, “more critical of myself than I use to be”, “feel sad much of the time”. One patient reported “past” depression and scored above the BDI-PC cut-off and answered high to questions such as relating to loss of pleasure and feelings of sadness (Figure 1d).