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ORIGINAL RESEARCH

The influence of personality traits and beliefs about medicines on adherence to asthma treatment

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Abstract

Aim: To explore the influence of personality traits and beliefs about medicines on adherence to treatment with asthma medication.

Methods: Respondents were 35 asthmatic adults prescribed controller medication. They answered questionnaires about medication adherence, personality traits, and beliefs about medicines.

Results: : In gender comparisons, the personality traits "Neuroticism" in men and "adherence to medication" were associated with lower adherent behaviour. Associations between personality traits and beliefs in the necessity of medication for controlling the illness were identified. Beliefs about the necessity of medication were positively associated with adherent behaviour in women. In the total sample, a positive "necessity-concern" differential predicted adherent behaviour.

Conclusion: The results imply that personality and beliefs about medicines may influence how well adults with asthma adhere to treatment with asthma medication.

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See linked editorial by Horne on pg 118

Introduction

The goal of modern asthma care is to gain and maintain control over the illness for long periods.[1] When asthma is controlled, patients can keep active, avoid attacks, and prevent troublesome symptoms. Effective asthma control requires regular preventive medication and a response to that medication. Poor receptiveness to asthma medication can be related to individual variability in the dose needed to achieve a response, as well as to low-adherent behaviour in relation to the asthma medication regimen.[1] In studies of adherence to asthma medication, low-adherent behaviour ranges from 25%–42%.[2-4]

The concept of adherence has been developed from the concept of compliance,[5] but opinions about the definitions of adherence and compliance differ. Compliance and adherence can be viewed as synonyms or as different concepts.[6] The increased use of the term adherence may be due to the sometimes passive and controlling undertone in the concept of compliance. Adherence emphasises the need for agreement and can be defined as the extent to which the patient's behaviour matches the agreed recommendations from the prescriber and the prescription.[7]

Many factors have been found to influence medication adherence, and those associated with non-adherent behaviour can be organised into five interacting domains: socioeconomic factors; therapy-related factors; patient-related factors; condition-related factors; and health care system factors.[7]

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In the present study, the focus is on patient-related factors – i.e., personality traits and beliefs about medicines. Personality traits are defined as "dimensions of individual differences in tendencies to show consistent patterns of thoughts, feelings and actions",[8] and can be organised into five broad bipolar domains, the so-called Five-Factor Model (FFM). The five domains are: *Neuroticism* (N), *Extraversion* (E), *Openness* (O), *Agreeableness* (A), and *Conscientiousness* (C). The personality traits *Agreeableness* and *Conscientiousness* have been found to have positive effects on health behaviour.[9-10] In addition, *Conscientiousness* was positively associated with adherence to medication regimens.[11] *Neuroticism* has been found to have a negative effect on health behaviour,[9] but the opposite has also been found; people who report high levels in negative affectivity may behave correctly because through their worries about asthma they tend to be more aware of illness-specific symptoms and correctly report and attribute these symptoms to asthma.[12]

According to McCrae's and Costa's "Model of the person",[8] personality traits (understood as underlying tendencies) may explain a person's thoughts, feelings and actions. The association between personality traits and medication adherence may therefore be indirect – i.e., the associations between these characteristics and beliefs about medicines may be of importance to adherent behaviour.[5] Research documenting associations between personality traits and adherence is limited. In patients with chronic illness[13] and asthma,[14] adherence to medication regimens has been found to correlate with beliefs about medicines. A theoretical framework has been developed to explain how beliefs about medicine can influence patients' decisions about taking medicines.[15] Adherent behaviour is likely to be associated with personal beliefs about the specific prescribed medication. Beliefs about the *necessity* of the medication for controlling illness are balanced against *concerns* about the possible negative effects of medication.[16] Adherent behaviour depends on which of the two predominates – beliefs in the necessity of the medication or concerns about possible danger.[13] In a sample of adult asthma patients, a relationship between higher scores on the necessity scale compared to the concerns scale and medication adherence was identified.[17] However, we do not fully understand how beliefs about medicines may influence adherent behaviour in relation to asthma medication.

The aim of the present study, therefore, was to explore the influence of personality trait and beliefs about medicines on adherence to asthma medication treatment in men and women.

Methods

Participants

Respondents in the present study were recruited from a larger sample in a study on the relationship between asthma and sensory hyperactivity.[18] Of the larger sample, 42 persons with asthma were invited to participate in the present study. Those who agreed to participate (n=35, 10 men and 25 women; response rate 83.3%) were all prescribed controller medication. The mean age in the group was 52.8 years (SD 14.7). They answered questionnaires about their personality traits, beliefs about medicines and medication adherence. The regional medical ethics committee approved the study.

Questionnaires

Medication Adherence Report Scale

The inventory Medication Adherence Report Scale (MARS) is a 5-item self-report scale for assessment of non-adherent behaviour (e.g., 'I forgot to take them' and 'I alter the dose'). The items are rated on a 5-point Likert scale, ranging from 1= 'very often to' 5 = 'never' (range 5 to 25). Lower scores indicate lower levels of adherent behaviour.[19] In the present study, Cronbach's alpha for MARS was 0.77.

NEO Five-Factor Personality Inventory

The NEO Five-Factor Personality Inventory (NEO-FFI) is a short form of the Revised NEO Personality Inventory (NEO-PI-R), and consists of 60 items, 12 items for each of the domains *Neuroticism, Extraversion, Openness, Agreeableness* and *Conscientiousness*. The items are rated on 5-point Likert scale ranging from 0 = 'strongly disagree to' 4 = 'strongly agree' (range 0 to 48).[20] In the present study, Cronbach's alpha for the five domains ranged from 0.68 to 0.88.

Beliefs about Medicines Questionnaire

Beliefs about Medicines Questionnaire specific (BMQ-Specific) assesses respondents' beliefs about their prescribed medication. The BMQ-Specific consists of two subscales: firstly, the *specific-necessity* scale assesses respondents' beliefs about the necessity of their prescribed medication for controlling their illness and maintaining their health (e.g., "my health, at present, depends on my asthma medication"); and secondly, concerns about the adverse consequences of taking prescribed medication are assessed using the *specific-concerns* scale (e.g., "I sometimes worry about the long-term effect of my asthma medication"). The items are rated on a 5-point Likert scale ranging from 1= 'strongly disagree' to 5= 'strongly agree' (range 5 to 25). A higher score on *specific-necessity* indicates stronger beliefs about the necessity of treatment, and a higher score on *specific-concerns* indicates stronger concerns.[13-16] A *necessity-concerns differential* score was calculated by subtracting the *specific-concerns* scale from the *specific-necessity* scale (range -20 to 20). A positive differential score indicates stronger necessity beliefs than concerns, and a negative score indicates the contrary – i.e., stronger concerns.[13] In the present study, Cronbach's alpha for the *specific-necessity* scale was 0.87 and for the *specific-concerns* scale 0.78.

Statistical analysis

The Statistical Package for the Social Sciences (SPSS) 17.0 was used. Descriptive statistics, frequencies, means, and standard

Table 1. Characteristics of the participants (n=35).

		Total n=35	Men n=10	Women n=25
Age	Mean (SD)	52.85 (14.72)	56.70 56.7)	51.25 (51.25)
Level of education	Compulsory school	9	1	8
	Grammar/High school	17	7	10
	College/University	8	1	7
	Missing data	1	1	
Occupation	Employee/Self-employed	23	6	17
	Pensioner	10	4	6
	Student	1		1
	Other	1		1
Medical treatment	Single ICS/LABA inhaler	17	5	12
	Separate ICS and LABA inhalers in combination	8	1	7
	Monotherapy	10	4	6

deviations were calculated, and Mann-Whitney's U-test was used to compared means between groups.[21] The Pitman's test (<0.05) and the Pearson's correlation coefficient (95 percent confident interval) were used to explore associations between variables. Further, linear regression analyses were performed including variables with significant associations with the variable MARS.

Results

Participants' characteristics

Of the 35 respondents, 17 were prescribed a combination corticosteroid (ICS)/long-acting β_2-agonist (LABA) inhaler, eight were prescribed ICS and LABA but in separate inhalers, and 10 were prescribed monotherapy (either ICS or LABA). Characteristics of the participants are presented in Table 1.

Personality traits and adherence to the medication regimen

The mean scores for personality traits and medication adherence measured by NEO-FFI and MARS in this group of asthmatics with controller medication (n=35) are reported in Table 2. No gender differences were identified.

Overall, the five personality traits did not correlate with MARS. However, in gender comparisons, higher scores in men on *Neuroticism* were associated with lower adherent behaviour scores, and higher scores in men on *Conscientiousness* were associated with higher adherent behaviour scores (Table 3). Further, in a multiple regression analysis of MARS in men including the independent variables *Neuroticism* and *Conscientiousness, Neuroticism* alone explained 52% (R^2 =0.52) of the variance. Each unit increase in *Neuroticism* in men decreased medication adherence by 0.41 units (p<0.01). In women, no associations between personality traits and adherent behaviour were identified.

Beliefs about medicines and personality traits

The mean scores for the Beliefs about Medicines Questionnaire (BMQ) *specific-necessity* and *specific-concerns* scales, and the *necessity-concerns differential*, are presented in Table 2. No gender differences were identified.

In calculations of the *necessity-concerns differential*, 32 respondents reported positive scores, meaning that their belief about the necessity of taking medication to control their illness was stronger than their concerns regarding the medication. For two of the respondents, the *necessity-concerns differential* score was zero, and only one person had a negative score (-1).

Associations between the *specific-necessity* scale and personality traits were found (see Table 4). A positive relationship between *Neuroticism* and the *specific-concerns* scale was found in the total group (r=0.39, p=0.02), showing stronger concerns about adverse consequences of taking the prescribed

Table 2. The mean of personality traits, MARS and BMQ (n=35).

	Total (SD)	Men (SD)	Women (SD)	Comparison (p-values men-women) [1]
Neuroticism	14.91 (9.10)	12.00 (6.50)	16.08 (9.82)	n.s.
Extraversion	31.28 (6.21)	31.20 (3.33)	31.32 (7.10)	n.s.
Openness	26.63 (6.17)	26.60 (3.27)	26.64 (7.06)	n.s.
Agreeableness	34.98 (5.85)	34.70 (4.57)	35.09 (6.37)	n.s.
Conscientiousness	35.30 (6.29)	36.20 (4.71)	34.94 (6.88)	n.s.
MARS	21.17 (3.22)	20.20 (3.71)	21.56 (3.00)	n.s.
Specific-Necessity	18.26 (4.60)	19.20 (3.88)	17.88 (4.88)	n.s.
Specific-Concerns	10.49 (4.21)	11.40 (3.81)	10.12 (4.38).	n.s.
NC/diff[2]	7.77 (5.66)	7.80 (5.73)	7.76 (5.74)	n.s.

MARS, Medication Adherence Report Scale; BMQ, Beliefs about Medicines Questionnaire.

[1] Mann-Whitney's U-test; [2] Necessity-concerns differential score

Table 3. Personality traits and BMQ association with MARS.

	Total sample (n=35)		Men (n=10)		Women (n=25)	
	p-values[1]	r (95% CI)[2]	p-values[1]	r (95% CI)[2]	p-values[1]	r (95% CI)[2]
Age	>0.30	-0.06 (-0.39 to 0.29)	0.12	0.57 (-0.09 to 0.88)	0.25	-0.26 (-0.60 to 0.16)
Neuroticism	0.06	-0.34 (-0.61 to -0.01)	0.03	-0.72 (-0.93 to -0.17)	0.15	-0.32 (-0.63 to 0.09)
Extraversion	0.30	0.19 (-0.15 to 0.49)	>0.30	0.26 (-0.44 to 0.76)	>0.30	0.20 (-0.21 to 0.55)
Openness	>0.30	-0.14 (-0.45 to 0.20)	0.22	-0.46 (-0.85 to 0.24)	>0.30	-0.09 (-0.47 to 0.32)
Agreeableness	>0.30	0.00 (-0.34 to 0.33)	0.15	0.52 (-0.16 to 0.87)	>0.30	-0.19 (-0.54 to 0.22)
Conscientiousness	0.16	0.26 (-0.08 to 0.54)	0.04	0.67 (0.07 to 0.92)	>0.30	0.17 (-0.24 to 0.53)
Specific-Necessity	0.03	0.38 (0.05 to 0.63)	>0.30	0.35 (-0.36 to 0.80)	0.03	0.45 (0.07 to 0.72)
Specific-Concerns	>0.30	-0.16 (-0.47 to 0.19)	0.15	-0.53 (-0.87 to 0.16)	>0.30	0.01 (-0.39 to 0.41)
Necessity-concerns differential score	0.02	0.42 (0.10 to 0.66)	0.09	0.59 (-0.07 to 0.89)	0.09	0.36 (-0.04 to 0.66)

MARS, Medication Adherence Report Scale; BMQ, Beliefs about Medicines Questionnaire

[1] Pitmans test; [2] Pearson's r

Table 4. Correlations between specific necessity scale and personality traits.

	Total sample (n=35)		Men (n=10)		Women (n=25)	
	p-values	r [1]	p-values	r [1]	p-values	r [1]
Neuroticism	0.051	-0.33	0.69	-0.14	0.09	-0.35
Extraversion	0.32	0.17	0.90	-0.05	0.31	0.21
Openness	0.23	0.21	0.90	-0.04	0.23	0.25
Agreeableness	0.16	0.24	0.02	0.71	0.47	0.15
Conscientiousness	0.047	0.34	0.25	0.40	0.12	0.32

[1] Pearson's r

Table 5. Correlation between necessity-concerns differential score and personality traits.

	Total sample (n=35)		Men (n=10)		Women (n=25)	
	p-values	r [1]	p-values	r [1]	p-values	r [1]
Neuroticism	<0.01	-0.56	0.11	-0.53	<0.01	-0.60
Extraversion	<0.01	0.44	0.43	0.28	0.01	0.49
Openness	0.04	0.35	0.39	-0.31	0.02	0.48
Agreeableness	0.07	0.31	0.053	0.62	0.28	0.23
Conscientiousness	<0.01	0.45	0.03	0.68	0.05	0.40

[1] Pearson's r

medication; however, this association was found in men (r=0.65, p=0.04), but not in women. Also, a negative relationship between *Extraversion* and the *specific-concerns* scale was found in the total group (r=-0.40, p=0.02). This association was found in women in the gender comparison (r=-0.41, p=0.04). Associations between the *necessity-concerns differential* score and personality traits are shown in Table 5.

Beliefs about medicines and adherence to medication regimens

A positive relationship between MARS and the *specific-necessity* scale was found, showing that a stronger belief in the necessity of medication for controlling illness was associated with higher adherence. This association was found in women, but not in men (Table 3). In addition, a simple linear regression analysis showed that in women, the scale *specific-necessity* explained 20% (R^2=0.20) of the variance in MARS. In women each unit increase in the *specific-necessity* scale increased adherence by 0.28 units (p<0.01). The scale *specific-concerns* was not related to medication adherence in women or in men. A positive relationship between the *necessity-concerns* differential and MARS was found in the total sample (Table 3).

Finally, in a multiple regression analysis of MARS in the total sample, with the independent variables *specific-necessity* scale and *necessity-concerns* differential (see Table 5), the latter variable explained the variance in MARS (R^2= 0.17). The *specific-necessity* scale was not associated with MARS. Each unit increase in the *necessity-concerns* differential increased adherence by 0.23 units (p<0.01).

Discussion

We have shown that the personality trait *Neuroticism* in men was associated with lower adherence to medication. Regarding beliefs about medicines, a belief in the necessity of medication for controlling illness was associated with a higher degree of adherence. In addition, a positive relationship between the *necessity-concerns differential* and adherence was found, indicating that having stronger beliefs about the necessity of treatment compared to concerns about negative consequences may increase adherence.

Our finding that *Neuroticism* in men was associated with a lower degree of adherent behaviour was not supported in an earlier study,[22] but during the past decade asthma medication regimens have developed further and it may be difficult to compare the present results with findings from a study conducted more than ten years ago. A person scoring high in *Neuroticism* has a tendency to experience fear, be concerned and feel anxious.[8] One possible explanation for the reason why men scoring high in *Neuroticism* reported low adherent behaviour may be that they also scored high on the BMQ *specific-concerns* scale. This could mean that they were worried about the negative consequences of medications and therefore refrained from following the prescribed medication regimen.

There is one previous study that focuses on the significance of personality in relation to medication adherence,[23] and there are some studies on beliefs about medicines[13,14,17,24-26] in relation to adherence to treatment with asthma medication. Earlier research on patient-related factors and adherence has focused on the importance of knowledge[27] and self-efficacy.[28] Further, the health beliefs model states that a person's behaviour is related to beliefs about different illness perception aspects. However, this model has yielded only weak positive relationships between patients' beliefs and behaviour.[29] The trans-theoretical model states that the provider of information should tailor the information to the patient's current state in order to improve adherence.[30] Since the adherent behaviour phenomenon is multidimensional, there are several other theoretical perspectives that could be discussed.[31] Common to them is that personality traits have not been taken into account – hence our rationale for investigating associations between personality traits, beliefs about medicines and adherence research.

One limitation of the present study was the small sample size, and therefore we are cautious about drawing conclusions. However, the association found between *Neuroticism* and adherence in adult asthmatics appears to be a useful finding. Findings from one study on heart failure patients showed an association between compliant behaviour and *Neuroticism*, which may indicate that persons scoring high on that personality trait can have problems with compliance.[32] Therefore, exploring the relation between personality traits and medication adherence would seem to be an important issue for healthcare professionals. Probably due to the small sample size, we could not completely confirm the findings from other studies that *Conscientiousness* tends to be positively associated with adherent behaviour in relation to medication treatment.[11,23,33,34] In the present analyses, *Conscientiousness* was first correlated with adherence, but was not shown further to be a predictor of adherent behaviour in the regression model. Also, medication adherence was measured by a self-report questionnaire which possibly could produce higher adherence scores compared to, for example, electronic monitor measures. However, self-reports are simple and inexpensive and could therefore be justified. Despite a large number of studies, the question of how best to measure adherence has not been answered.[35]

In the present study, beliefs about medicines were found to be possible indicators of adherent behaviour, such that a stronger belief in the necessity of the medication in women and the *necessity-concerns differential* in the total sample were associated with higher adherence. This result is in line with earlier studies showing that when beliefs in the necessity of medication are stronger than concerns, the adherent behaviour will increase.[13,17] The most adherent individuals are those who accept the necessity of medication and have low concerns about potential adverse consequences.[17,24]

A study by Smith, Mitchell and Bowel[36] showed that a patient-centred asthma education programme led to fewer health care re-attendances than a standardised education programme. In our opinion, personality traits could be used to guide efforts to educate asthma patients. The results add knowledge about the relationships between personality traits, beliefs about medicines, and adherent behaviour in adult asthma patients. Such knowledge can be used as a basis for developing individualised treatment plans tailored to patients' personality and their beliefs about medicines. The present results indicate that difficulties with low medication adherence can be anticipated beforehand, given the patient's personality characteristics and medication beliefs. For instance, a person who is generally neurotic is likely to experience barriers to taking medication grounded on concerns about potential adverse effects and the way he/she balances the perceived benefit beliefs (necessity) against the perceived risks (concerns). If healthcare professionals were to

Discussion Summary

a) Difficulties in this study: The sample size was small, and therefore we are cautious about drawing conclusions.

b) Alternative methodologies: Medication adherence can be measured in different ways, e.g. electronic monitor measures.

c) New questions: Would a trial in a larger sample further explore the relationship between personality traits and medication adherence?

d) Lessons: Results indicate the need for a personal approach to improve adherent behavior and enhance understanding of the necessity of asthma medication.

reflect on such dilemmas in a person scoring high on the trait neuroticism, and can reduce the patient's anxiety and worries, some adherence problems could be reduced through individualised communication and support. On the other hand, a conscientious person may more likely balance the beliefs about necessity and concerns and may not need the same specific treatment. This implies that assessment of personality traits and beliefs about medicines may prove to be a useful part of care-planning.

Conflicts of interest

None to declare.

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