

# Personality types of patients with glaucoma

## A systematic review of observational studies

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### Abstract

**Objectives:** To synthesize recent empirical research on the association between personality and glaucoma among this sub-population.

**Methods:** PubMed/MEDLINE, Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE, Scopus and ScienceDirect databases were searched to identify eligible studies published between January 1950 and March 2019 in any language. The quality of included observational studies was assessed using an 11-item checklist which was recommended by Agency for Healthcare Research and Quality (AHRQ). After using the checklist, 12 papers are included into the systematic review.

**Results:** There are some differences on the studies about the negative personality of glaucoma patients. In spite of these differences, most included studies significantly showed that glaucoma patients tend to or do have some specific personality.

**Conclusion:** The extant research could demonstrate that glaucoma patients tend to have some negative personality in some extent. Future studies are needed to provide more convincing support to personality of glaucoma patients.

**Abbreviations:** 16PF = the Sixteen Personality Factor Questionnaire, ACG = angle closure glaucoma, AHRQ = Agency for Healthcare Research and Quality, BDI = Beck Depression Inventory, CENTRAL = Cochrane Central Register of Controlled Trials, IOP = intraocular pressure, MMPI-2 = Minnesota Multiphasic Personality Inventory-2, MPI = Maudsley Personality Inventory, NEO-FFI = Neuroticism Extraversion Openness Five-Factor Inventory, OAG = open-angle glaucoma, PACG = primary angle-closure glaucoma, POAG = primary open angle glaucoma, RP = retinitis pigmentosa, SCL-90 = Symptom Checklist 90, TCI = temperament and character inventory.

**Keywords:** glaucoma, observational studies, personality, systematic review

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ZT and T-HT have contributed equally in this study.

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## 1. Introduction

Glaucoma is the second leading cause of blindness worldwide.<sup>[1]</sup> Previous study indicated that 79.6 million people will have open-angle glaucoma (OAG) and angle closure glaucoma (ACG), and Asians could constitute of 74.6% of these people,<sup>[1]</sup> which means that glaucoma will be a risky factor to blindness. In addition, the number of people with bilateral blindness will increase dramatically from 8.4 million to 11.2 million,<sup>[1]</sup> which seems a huge burden for family and society. The early detection of this disorder by screening followed by appropriate intervention may offer a practical means for the prevention of condition-associated visual damage.

Life stressors, such as those from work or hospital experiences, may have more adverse effects on the health of patients with glaucoma than healthy individuals.<sup>[2,3]</sup> Research has shown a direct and significant difference between social isolation during hospitalization with depression, anxiety, and stress.<sup>[4]</sup> In order to provide more effective treatment for glaucoma patients, their mood and personality characteristics are increasingly being paid attention to.<sup>[5]</sup> Although many studies explored the negative psychological factors or specific personality of glaucoma patients, they all empathized the important roles of the negative psychological factors or specific personality in the treatment of glaucoma.<sup>[6–13]</sup> Stress reduction, like biofeedback, meditation, and relaxation exercises could avoid glaucoma and reduce the intraocular pressure (IOP).<sup>[6]</sup> To improve the emotional condition of glaucoma patients seemed to be meaningful for the quality of patients' lives and the treatment.<sup>[7]</sup> Also, the psychological support, such as autogenic training, was recommended when the patients showed psychological disturbances.<sup>[8]</sup> Li et al<sup>[9]</sup> agreed

that stress was a reason of the incidence of glaucoma, suggested that changes of psychological factors can in turn influence the treatment of glaucoma. The psychological treatment was necessary in glaucoma patients.<sup>[11]</sup>

To the best of our knowledge, this study is the first systematic review to examine associations between personality and glaucoma. Based on anterior studies, this systematic review focus on the category of personality presented on the glaucoma patients to support the treatment of glaucoma and improve the quality of patients' life. This paper is divided into 5 sections. Section 1 discusses the background information as above. Section 2 provides the research material and the proposed systematic review. Section 3 reports the results. Section 4 provides discussions with an illustration of clinical implications and Section 5 concludes this study.

## 2. Material and methods

This study carried out a systematic review of the personality outcome of glaucoma patients compared with patients without glaucoma.

### 2.1. Literature search

This study searched PubMed/MEDLINE, the Cochrane Central Register of Controlled Trials (CENTRAL), EMBASE, Scopus, and ScienceDirect for relevant publications added up to and including March 31, 2019 without restriction on language. The search strategy is shown in the Table 1.

### 2.2. Data sources and searches

The inclusion criteria were subjects with any kind of glaucoma were not limited in age, sex, and ethnicity; outcomes included personality measure; subjects in control group didn't have glaucoma if the study set control groups. Five hundred ninety four duplicates were removed using the Endnote software, leaving 777 studies of which 744 were excluded following screening of the abstract as they did not meet the eligibility criteria. The full texts for the remaining studies were assessed for eligibility, resulting in exclusion of a further 21 studies. Thus, 12 studies were included in the systematic review. The preferred reporting items for systematic reviews and meta-analyses (PRISMA) study flow chart is shown in Fig. 1.

### 2.3. Study selection

In this systematic review, 12 studies reported inclusion and exclusion criteria clearly. All studies reported the design, context, and time. Eleven studies set the control group, while only one study didn't set the control group. The inclusion criteria applied in all studies were that all case group had glaucoma disease, including primary open-angle glaucoma, open-angle glaucoma, primary angle-closure glaucoma, normal-tension glaucoma, normal-extension glaucoma. All studies reported the exclusion criterion. All studies reported the measurement of personality, like Yatabe-Guilford personality test, Minnesota Multiphasic Personality Inventory-2 (MMPI-2) test, Turkish version of temperament and character inventory (TCI) etc.

### 2.4. Quality assessment

The methodological quality of the studies was appraised independently by 2 authors on the basis of 4 criteria: method

of random assignment, description of blind design, dropout rate and reasons for dropping out, and follow-up time points. Differences of opinion were resolved through discussion. The quality of included observational studies was assessed using an 11-item checklist which was recommended by Agency for Healthcare Research and Quality (AHRQ) (Table 2).

### 2.5. Data synthesis and analysis

There were 2 broad outcome variables: negative personality, which is harmful for health, like nervousness, poor health, hysteria, depression, etc; neutral personality, which has no clear effect on health, like no particular personality.

### 2.6. Ethical review

Due to the systematic review and meta-analysis design, the ethical approval was waived and not necessary in this study.

## 3. Results

### 3.1. Characteristics of the included studies

As Table 3 shows, 4 studies are instructed in China. There are 2 studies conducted in United States, Japan, and Italy respectively. One study was implemented in Germany, Italy, and Turkey respectively. Sample size of all included studies ranged from 35 to 419, with a total of 1997 participants across all studies. There were no restrictions on the sex of all included studies, and mean age of all included studies ranged from to 49.2 to 66.8. The participants of experimental group had glaucoma without any other ocular disease that can cause an increase of interocular pressure except cataract.<sup>[14-18]</sup> One study would exclude the patients with unreliable visual criteria or additional ocular abnormalities.<sup>[19]</sup> The exclusion criteria of 3 studies is known psychiatric disorders, diabetes mellitus, and treatment with steroids or systemic medications.<sup>[8,10,15,16,18-20]</sup> Four studies stated the criteria of control group or referee group explicitly.<sup>[15,18-21]</sup> Two studies assured that the difference was no significant in age and sex for control group and experimental group.<sup>[15-17,19,20,22]</sup> Seven studies didn't consider the duration of glaucoma.<sup>[12,15,17,19-22]</sup>

### 3.2. Characteristics of case group and control group

Eight studies set 2 groups: experimental group and control group. One study set 3 groups: normal group, retinitis pigmentosa (RP) group, and glaucoma group.<sup>[17]</sup> Two studies set similar groups:

**Table 1**

**The detailed search items in PubMed following the PRISMA guideline (similar search run in other databases).**

Database	Search item
PubMed	#1 personality
	#2 character
	#3 temperament
	#4 disposition
	#5 outgoing
	#6 emotion
	#7 #1 or #2 or #3 or #4 or #5 or #6
	#8 glaucoma
	#9 #7 and #8

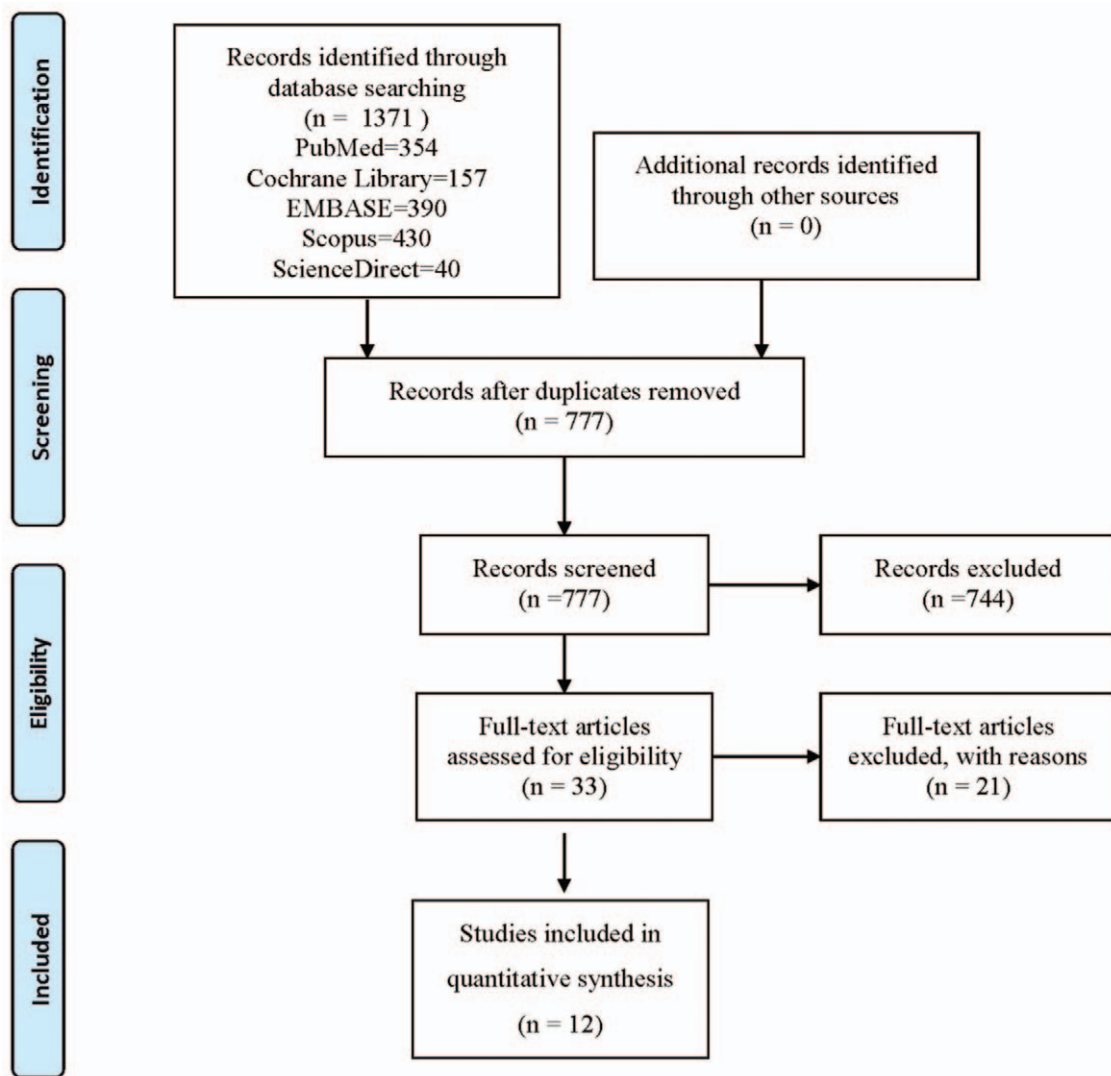


Figure 1. PRISMA study flow chart.

Table 2

The results of 11-item checklist for healthcare research and quality.

No.	Research item	Evaluation index											Total points	
		①	②	③	④	⑤	⑥	⑦	⑧	⑨	⑩	⑪		
1	Mabuchi, F <sup>[7]</sup> et al, 2005, Japan	1	1	0	1	1	1	1	1	1	0	1	0	8
2	Igarashi, Y <sup>[10]</sup> et al, 2003, Japan	1	1	0	1	1	1	1	1	1	0	1	0	8
3	Lim, MC <sup>[8]</sup> et al, 2007, United States	1	1	1	1	1	1	1	1	1	0	1	0	9
4	Erb, C <sup>[6]</sup> et al, 1999, Germany	1	1	1	1	1	1	1	1	1	0	0	0	8
5	Çakmak, H <sup>[9]</sup> et al, 2015, Turkey	1	1	0	1	1	1	1	1	1	0	0	0	7
6	Bubella, RM <sup>[3]</sup> et al, 2014, Italy	1	0	1	1	1	1	1	1	1	0	0	0	7
7	Berger, AS <sup>[2]</sup> et al, 1956, United States	1	1	0	1	1	1	1	1	1	0	0	0	7
8	Scuderi, G <sup>[12]</sup> et al, 2011, Italy	1	1	0	1	1	1	1	1	1	0	0	0	7
9	Xiangmei K, <sup>[4]</sup> et al, 2015, China	1	1	1	1	1	1	1	1	1	0	0	0	8
10	Jia L, Yan L <sup>[2]</sup> 2015, China	1	1	1	1	1	1	1	1	1	0	0	0	8
11	Hui P, <sup>[9]</sup> et al, 2017, China	1	1	1	0	1	1	1	1	1	0	0	0	7
12	Li C, <sup>[3]</sup> et al, 2009, China	1	1	1	1	1	1	1	1	1	0	0	0	8

**Table 3**  
**Characteristics of 7 observational studies included in this systematic review.**

No.	Author	Year, country	Participants	Age	Sex (M/F)	Time since diagnosis of glaucoma, yrs	Measure tools	Personality outcomes
1	Mabuchi, F <sup>[7]</sup> et al	2005, Japan	196 patients with POAG 223 controls with no ocular disease except cataract (without glaucoma)	Male patients: 62.4 ± 12.8 Female patients: 64.7 ± 12.8 Controls men: 64.9 ± 13.6, women: 66.9 ± 12.8	Patients: (99/97) Controls: (87/136)	Male patients: 5.2 ± 4.3; Female patients: 6.1 ± 4.6	The Japanese language version of NEO-FFI	Characteristic personality traits were noted in POAG patients. (for POAG men: higher mean N scores $P = .013$ ; lower mean scores for A&C $P = .007$ $P = .001$ ; for POAG women: lower mean E score $P = .023$ ) Glaucoma patients showed a significantly higher score for nervousness. ( $P = .014$ )
2	Igarashi, Y <sup>[10]</sup> et al	2003, Japan	42 patients with glaucoma (29 cases of POAG, 6 of PACG, and 7 of NTG); 47 controls	Patients: 54 ± 14.1 Controls: 49.2 ± 14.7	Patients: (23/19) controls: (23/24)	NA	The Yatabe-Guilford personality test	Patients with OAG had more abnormal MMPI-2 scores in areas that focus upon concerns of somatic complaints and poor health. (OAG: higher Hs ( $P = .0082$ ), Hy, ( $P = .0056$ ), HEA ( $P = .0025$ ) higher scores for hysteria ( $P = .0262$ ) and health concerns (0.0018) Patients with NTG show evident psychosomatic involvement.
3	Lim, M <sup>[6]</sup> et al	2007, United States	56 patients with OAG 52 controls	Patients: 66.8 ± 11.5 Controls: 64.5 ± 11.5	Patients: (19/31) Controls (27/23)	Patients: 5.8 ± 4.5 Controls: NA	MMPI-2 test	(for NTG, in von Zerssen Symptom List, BL1 and BL2 were highly correlated, $P < .0001$ ) Glaucoma patients had a different personality profile to healthy individuals. (for glaucoma patients: higher scores for HA and SD dimensions, $P = .033$ ; lower scores for the NS, P and ST dimensions, $P = .002$ .) In the type A subjects, there was a much more significant visual field involvement ( $P = .001$ );
4	Erb, C <sup>[6]</sup> et al	1999, Germany	24 patients with NTG 24 controls	Patients: 58 ± 15.3 Controls: 56 ± 13	Patients: (3/21) Controls: (3/21)	Patients: NA Controls: NA	The von Zerssen Symptom List, the Maudsley Personality Inventory, the BDI, the 16PF.	
5	Çakmak, H <sup>[9]</sup> et al	2015, Turkey	104 patients with OAG 130 controls without ocular disease	Patients: 59.36 ± 10.38 Controls: 57.34 ± 8.27	Patients: (50/54) Controls: (63/67)	Patients: 5.1 ± 3.87 Controls: NA	The Turkish version of TCI	
6	Bubella, RM <sup>[3]</sup> et al	2014, Italy	50 patients with OAG No controls	OAG: 63.42 ± 12.9	OAG (20/30)		Type A/B personality questionnaire (Jenkin Modified Activity Survey); Ercta-B test for the further evaluation of type A personality; STAY test; Brief-cope test Psychiatric interview and psychological tests	
7	Berger, AS <sup>[2]</sup> et al.	1956, United States	19 patients with glaucoma 16 controls	Patients: 63.1 Controls: 56.9	Glaucoma: (7/12) Controls: (5/11)	Patients: 3.2 Controls: 3.9		There is no particular personality configuration specific to glaucoma.
8	Scuderi, G <sup>[12]</sup> et al	2011, Italy	91 patients with OAG 300 controls	Patients: 64.51 ± 10.62 Controls: 23.20 ± 3.15	Patients: (52/39) Controls: (123/177)	Patients: NA Controls: NA	the Beck Hopelessness Scale; the TEMPS-A (Rome); the Gotland Male Depression Scale; the Emotional Well-being Scale	Open-angle glaucoma patients (compared with a non-clinical sample of university students) had higher scores on the TEMPS-A dysphoric and hyperthymic traits and lower scores on cyclothymic, irritability and anxiety traits.
9	Xiangmei K, <sup>[4]</sup> et al	2015, China	100 patients with glaucoma (50 cases of POAG, 50 of PACG) 50 controls	PACG patients: 58.16 ± 14.42 POAG patients: 52.86 ± 12.64 Controls: 58.28 ± 14.97	PACG patients: (19/31) POAG patients: (33/17) Controls: (25/25)	PACG patients: 3.72 ± 5.16 POAG patients: 5.44 ± 6.10 Controls: NA	Self-rating Anxiety Scale (SAS), Self-rating Depression Scale (SDS), Eysenck Personality Questionnaire (EPQ), and Defense Style Questionnaire (DSQ).	The scores of SAS and SDS were higher in glaucoma patients than in controls. The values of psychoticism and neuroticism in EPQ for the PACG and POAG groups were significantly higher than those for controls ( $P < .05$ ). In DSQ, PACG, and POAG patients adopted immature and neurotic defense styles more often than controls ( $P < .05$ ).

(continued)

**Table 3**  
**(continued).**

No.	Author	Year, country	Participants	Age	Sex (M/F)	Time since diagnosis of glaucoma, yrs	Measure tools	Personality outcomes
10	Jia L., Yan L. <sup>[2]</sup>	2015, China	179 patients with glaucoma (87 cases of POAG, 92 of PACG) 89 controls	PACG Patients: 60.07 ± 13.28 POAG patients: 61.18 ± 11.32 Controls: 62.76 ± 8.48	PACG patients: (48/44) POAG Patients: (42/45) Controls: (41/48)	Patients: NA Controls: NA	Eysenck Personality Questionnaire (EPQ), Self-rating Anxiety Scale (SAS), Self-rating Depression Scale (SDS) Symptom Checklist 90 (SCL-90)	In SCL-90, the scores were increased in the patients of the POAG group and the PACG group than those in the normal control group. And the scores were increased in the PACG group compared with the POAG group (all at $P < .05$ ). EPQ data showed that the scores of psychology and nervousness in the POAG group and the PACG group were higher than those in the normal control group (all at $P < .05$ ), but no significant differences were found in extroversion and stability of the personality among the three groups ( $P = .3231$ ). .315). The total scores of SAS and SDS were considerably higher in the POAG group and the PACG group compared with the normal group or the PACG group compared with the POAG group (all at $P < .05$ ). The anxiety, depression, and stronger stress response are found in glaucoma patients, especially PACG patients.
11	Hui P. <sup>[2]</sup> et al	2017 China	30 patients with PACG 30 healthy controls	Patients: 60.73 ± 8.88 Controls: 60.70 ± 9.97	Patients: (15/15) Controls: (15/15)	Patients: NA Controls: NA	Chinese edition of the EPQ	Higher neuroticism score in EPQ was found in PACG patients compared with healthy controls (14.97 ± 3.93 vs 9.90 ± 4.49, $P < .001$ ). Neuroticism scores in EPQ were associated with decision-making performance ( $r = 0.417$ , $P = .001$ ). In SCL-90, the scores of somatization, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism in patients with PACG were higher than those in normal subjects ( $P < .05$ ). In A-style behavior, the score of TH in patients with PACG was higher than those in normal subjects, but there was no difference between 2 groups in TH+CH and CH. In EPQ, the score of psychology and nervousness in the group with PACG was higher than that in normal subjects ( $P < .05$ ). The psychological factor seems to be obviously associated with the onset of PACG. The patients with PACG were mainly A-style personality, and their psychology and nervousness are connected with the onset of PACG.
12	Li C. <sup>[2]</sup> et al	2009 China	100 patients with PACG 45 normal subjects	PACG Patients: 64.9 ± 13.2 Controls: 62.7 ± 12.8	Patients: (44/56) Controls: (21/24)		SCL-90, Chinese edition of Eysenck Personality Questionnaire (EPQ), Chinese edition of Type A Behavior Pattern Scale (TABP)	In SCL-90, the scores of somatization, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation and psychoticism in patients with PACG were higher than those in normal subjects ( $P < .05$ ). In A-style behavior, the score of TH in patients with PACG was higher than those in normal subjects, but there was no difference between 2 groups in TH+CH and CH. In EPQ, the score of psychology and nervousness in the group with PACG was higher than that in normal subjects ( $P < .05$ ). The psychological factor seems to be obviously associated with the onset of PACG. The patients with PACG were mainly A-style personality, and their psychology and nervousness are connected with the onset of PACG.

16PF = the Sixteen Personality Factor Questionnaire, BDI = Beck Depression Inventory, MMPI-2 = Minnesota Multiphasic Personality Inventory-2, NEO-FFI = Neuroticism Extraversion Openness Five-Factor Inventory, OAG = open-angle glaucoma, PACG = primary angle-closure glaucoma, POAG = primary open angle glaucoma, TCI = temperament and character inventory.

primary open angle glaucoma (POAG) group, primary angle-closure glaucoma (PACG) group, and control group.<sup>[15,16]</sup> One study didn't set any control group.<sup>[12]</sup> Another study set 2 groups: control group and experimental group.<sup>[14]</sup> It requested that subjects of control group were patients from hospitals who had no glaucoma or other ocular diseases, except for cataract. Including the patients with cataract could make the range of visual acuity of control group similar to that in experimental group. One study excluded the patients with any ocular diseases which can cause a loss of visual function from the experimental group.<sup>[14]</sup> It asserted that all the subject with any factors which could influence the personality, like central nervous system diseases etc, would be excluded from the study, avoiding influence the results.<sup>[14]</sup> One study didn't report the exclusion of any subject with mental disorder factors.<sup>[21]</sup> Another study didn't report how to select the subject of experimental group, except the exclusion criteria that eliminate the subject with psychiatric disorders, hypertension, diabetes mellitus, and bronchial asthma.<sup>[8]</sup>

One study assured that subject of control group didn't have any no previous or current ocular or general acute or chronic disease or under medication, and set the matched-age and matched-gender between the experimental group and control group.<sup>[8]</sup> One study just reported that patients with glaucoma could be included in experimental group and that subject without any ocular disease could be included in control group.<sup>[19]</sup> Another study stated how to select patients of case group in details, who were limited to newly diagnosed cases of glaucoma undergoing evaluation. And the subject of control group, without glaucomatous eye disease, matched as to age, sex, race, socioeconomic class, chronicity of eye disease, and degree of visual impairment.<sup>[22]</sup>

In addition, 1 study set 3 groups: control group, retinitis pigmentosa group, and glaucoma group. This study excluded the subject with psychiatric disorders, diabetes mellitus, and treatment with steroids or systemic medications.<sup>[17]</sup> Three studies set the age and sex matched between the 3 group and assured that the differences in sex and age were not statistically significant in 3 groups.<sup>[15-17]</sup> Another study set the only one group, which contained all glaucoma patients without significant differences in disease duration.<sup>[12]</sup>

### 3.3. Measurement of personality

All the included studies can be sorted into 2 categories, that is, negative personality and neutral personality according to the examined personality, which were associated with glaucoma patients.

**3.3.1. Negative personality.** One study used the NEO-FFI to evaluate the personality of subjects. Comparing the results of the control group and experimental group, this study found that male patients with glaucoma had higher mean N scores and lower mean A and C scores, which mean that male patients with glaucoma intended to have more emotional fluctuation, instability, and to be less soft-hearted, trusting, helpful, forgiving, responsive, hard-working, reliable, scrupulous, ambitious.<sup>[14]</sup> They also found that female patients had significantly lower mean E scores, which mean that female patients with glaucoma tended to be less talkative, sociable, affectionate, active, optimistic, and fun-loving.<sup>[14]</sup> In a word, a more salient relationship between glaucoma and personality existed in male glaucoma patients than

in female glaucoma patients.<sup>[20]</sup> used the Minnesota Multiphasic Personality Inventory (MMPI-2) to assess the personality of subjects. They found that glaucoma patients had significantly higher hypochondriasis, hysteria, health concerns, depression-clinical scale, and antisocial practices.<sup>[20]</sup> Based on the description of hypochondriasis, hysteria, and health concerns scales, the conclusion is that glaucoma patients tended to have more social anxiety, difficulties with sleep, and somatic problems related to stress.<sup>[20]</sup> Another study used the von Zerssen Symptom List (psychosomatic discomfort), the Maudsley Personality Inventory (MPI-N, emotional status, and MPI-E, extroverted-introverted), the Beck Depression Inventory (BDI), and the Sixteen Personality Factor Questionnaire (16PF) to appraise the glaucoma patients. Compared with the control group, glaucoma patients showed significantly more complaints (von Zerssen Symptom List), and were more emotionally unstable (MPI-N).<sup>[8]</sup> The glaucoma patients showed a salient negative correlation between the duration of illness and psychic endurance, which mean that duration of glaucoma can sap self-control and self-assurance of glaucoma patients.<sup>[8]</sup> In a word, they hold a view that glaucoma patients were associated with these negative psychological disturbances, and pointed out that the relation between glaucoma and negative psychological disturbances was unclear.<sup>[8]</sup>

In addition, one study set 3 groups (the control group, the retinitis pigmentosa group, and the glaucoma group).<sup>[13]</sup> Two types of questions are used in the study, that is, identification of personality traits and determination of the personality distribution.<sup>[13]</sup> The former included 12 personality traits, while the latter divided the subjects into 5 types through the Yatabe-Guilford Profile personality test. The level of nervousness in the glaucoma group is significantly higher than in control group and retinitis pigmentosa group.<sup>[17]</sup> What's more, 2 studies setting 3 group (control group, POAG group, PACG group) proved that the level of anxiety and depression of glaucoma patients tended to be higher and that personality and behavior factors were associated with glaucoma. One study aimed to evaluate the incidence of type A behavior in open-angle-glaucoma (OAG) patients and to assess the possible role of stress as a risk factor for OAG. The results showed that 64% of the patients showed type A behavior, 54% of the subjects assessed also showed a trait anxiety, which exceeded the cutoff point. Both trait and state anxiety proved to be more evident in type A subjects.<sup>[12]</sup>

**3.3.2. Neutral personality.** One study used the Turkish version of the temperament and character inventory to measure 3 dimensions of character; self-transcendence, cooperativeness, self-directedness, and 4 dimensions of temperament: harm avoidance, persistence, novelty seeking, reward dependence.<sup>[19]</sup> The results indicated that glaucoma patients got significantly higher scores on self-direction and harm avoidance, and that glaucoma patients got significantly lower scores on persistence, novelty seeking, and self-transcendence.<sup>[22]</sup> Based on the results, this study argued that glaucoma patients tend to have specific personality factors. Another study examined 19 glaucoma patients and 16 subject of control group. Although this study found that psychic factors had important role in ocular diseases, but this study didn't find any specific personality related to glaucoma.<sup>[21]</sup> Therefore, neutral personality is not related to the glaucoma at the moment, because the relative research is limited.

In the 12 literatures included in this study, glaucoma patients had more negative personality than neutral personality. There were 10 articles describing the relationship between glaucoma

patients and negative personalities, and 2 articles describing the relationship between glaucoma patients and neutral personalities.

The contents described in these articles can be roughly divided into 2 aspects, namely the individual characteristics and behavioral characteristics of glaucoma patients. In terms of the personality characteristics of patients with glaucoma, anxiety is the most common psychological reaction in patients with glaucoma.<sup>[14,16–20]</sup> Glaucoma patients have a higher prevalence of anxiety and depression, and psychological factors should be considered in their treatment. In terms of behavioral characteristics, the decision-making function of patients with glaucoma is often impaired, manifested as a reduced preference for risky decisions, a reduced ability to use negative feedback, and excessive stress responses in daily life.<sup>[15,19]</sup>

## 4. Discussion

### 4.1. Clinical implication

This systematic review not only synthesized the relationship between glaucoma and specific personality, but also admitted that glaucoma patients tended to have some negative personality. Although only 2 included studies stated that glaucoma patients had or didn't have specific personality, all eligible selected studies conceded that psychiatric factors had an important role in the glaucoma patients. The results indicated that one should pay attention to the mind of glaucoma patients, which could help to ameliorate the therapeutic effects of glaucoma patients and quality of life.

In glaucoma patients, the importance of personality structure has proven the perception that there is a maintenance of high levels of stress.<sup>[19]</sup> The differences in personality structure (e.g., excitable temperament, perfectionistic pattern, neuroticism, hypochondriacal tendencies, irritability, anxiety traits, and type A behavioral pattern introversion) of glaucoma patients have been reported on for a long time. However, personality was not measured by the criteria with good reliability and validity, and a consistent personality profile of glaucoma patients also has yet to be established.

For the negative psychological factors of glaucoma patients, previous studies also focused on the personality straits of glaucoma patients. Patients with primary glaucoma didn't have some specific personality, in corresponding to patients without glaucoma.<sup>[21]</sup> However, after comparing the control group and retinitis pigmentosa (RP) group, the glaucoma group had a higher nervousness value using the Yatabe-Guilford personality test.<sup>[17]</sup> So it may be concluded that glaucoma patients tended toward nervousness.<sup>[17]</sup> Although the conclusion was dynamic, this study just tested the nervousness and didn't use a common assessment method of personality. Using a case-control study design, a research applied a 5-factor of personality structure on the glaucoma patients.<sup>[14]</sup> This study set the 5 factors: neuroticism (N), extraversion (E), openness (O), agreeableness (A), and conscientiousness (C) and designed a special questionnaire: NEO-FFI. Comparing the male referee subjects, the male patients with glaucoma had higher value in neuroticism and lower value in agreeableness and conscientiousness. In addition, the female patients with glaucoma had lower value in extraversion.<sup>[14]</sup> This implied that some specific personality related to glaucoma patients have been found. Another study aimed to discover the personality and behavior characteristics of primary open-angle

glaucoma (PACG) patients, conducted a survey on 100 glaucoma patients and 45 normal subjects using a questionnaire of Symptom Checklist 90 (SCL-90) and style behavior.<sup>[18]</sup> The results showed that the patients with PACG were mainly a-style personality. Similarly results also found that concentrated on the presence of type A behavior in patients with open-angle glaucoma (OAG). 64% of these OAG patients presented type A behavior, and in the type A behavior patients, there was a significant visual field involvement.<sup>[12]</sup> Although the author admitted that they have not found any strong evidence to prove the relationship between personality and glaucoma, they also pointed out that personality is an important part of glaucoma patients research.<sup>[12]</sup>

The mental aspect of patients could influence the ocular diseases.<sup>[23]</sup> Based on the experimental investigation, glaucoma inpatients and nonglaucoma inpatients had a significant difference in personality. Nonglaucoma patients had a normal or balancing personality, while glaucoma patients tended to be nervous.<sup>[24]</sup> Using MMPI, the glaucoma patients had high values on the scale of "depression," "hypochondria," and "hysteria." Psychogenic blindness was caused not only by the mechanism of hysterical conversion but also by a tendency to regression in schizoid neurotic structure.<sup>[25]</sup> For the patient with closed-angle glaucoma, stress may affect the IOP, which also can be affected by the emotional state of patients. IOP is an important indicator of closed-angle glaucoma patients, so it may be suggested that reducing stress can help the patients to mitigate the symptom.<sup>[6]</sup> The IOP also could be influenced by stress.<sup>[7]</sup> For the patients with normal-tension glaucoma, complaints and emotionally instability was more evident than patients without any ocular diseases. In addition, a study found that the incidence and recurrence of glaucoma were related to mind and emotion.<sup>[9]</sup> Another study found that hyposensitivity or hypersensitivity may be "trait" markers of individuals with major affective disorders and that individual with major affective disorders may suffer from difficulties in processing sensory input.<sup>[26]</sup> Recently, based on a large population, a retrospective case-control study found a statistically significant association between glaucoma and each of anxiety and depression.<sup>[27]</sup> There still are some controversy on the field, whether the glaucoma is the result or reason of some negative psychological factors. However, the association between glaucoma and some negative psychological factors has been confirmed.

### 4.2. Clinical practice

This systemic review found that although there still are some discrepancy in the relationship between glaucoma and negative personality, clinicians should consider the spirit of glaucoma patients when they communicate with the patients or determine the therapeutic schedule. One study pointed that patients with glaucoma usually fear the loss of vision, so these patients tended to be more nervous, anxious, and depressed.<sup>[21]</sup> Previous study further indicated that social isolation has a relation to depression, anxiety, and stress. The higher age and less level of education have a negative relation to social isolation.<sup>[4]</sup> What's more, some medicine related to treatment of glaucoma patients may have some impact on spirit of glaucoma patients. In summary, ophthalmologists should notice the mentality of glaucoma patients and the mental effect of medical treatment, which can be beneficial for patients.

### 4.3. Methodological considerations

This systemic review has some limitations, which could not be ignored. Firstly, 2 of the included studies argued that glaucoma patients may have no the negative personality, which is opposite to this review. Although psychic factors had important role in ocular diseases, there wasn't any specific personality related to glaucoma. Then, in practice, it is difficult in some extent for ophthalmologists to consider the ocular disease with focusing on the mental health of glaucoma patients. Some ocular doctors may not have psychological knowledge. Last, the included studies weren't cohort study at all, so the reliability of these opinions still need to be improved.

### 5. Conclusion

In conclusion, this systematic review indicated the importance of personality type of glaucoma patients in the medical treatment. Additional long-term follow-up studies are warranted to adequately assess the causal-relationship between personality type and glaucoma.

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