

Exploring autistic-like traits relating to empathic attitude and psychological distress in hospital pharmacists

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the number of words of

the article (3486), of the abstract (339), and of the references (1191).

Ethical considerations

This study was approved by the Ethics Committee of the Okayama University Graduate School of Medicine, Dentistry and Pharmaceutical Sciences on December 25, 2013 (receipt number 776).

Acknowledgements

The authors thank the Okayama Society of Hospital Pharmacists, Shoko Yoshimoto, Yifei Tang and Kyoko Hageshita.

Funding

The Research for Promotion of Cancer Control Programmes (H26-Gan Seisaku-ippan-002 and H25-Seishin-ippan-001) Health and Labour Sciences Research Grants from the Ministry of Health, Labour and Welfare, Japan.

1 **Introduction**

2 Pharmacists have traditionally played a leading role in cancer care teams in establishing
3 central services for compounding cytotoxic drugs and offering therapeutic drug
4 monitoring for critical substances [1]. However, the Cancer Control Act, enforced in
5 2007 in Japan, has made pharmacists essential members of palliative care teams. Cancer
6 care involves dealing with patient emotions and empathizing with psychological distress.
7 Unsurprisingly, cancer imposes a heavy psychological burden on the patient during the
8 process of diagnosis and treatment. Treatments such as cancer chemotherapy are
9 accompanied by both the communication of bad news (e.g., end-of-life treatment
10 recommendations) and painful physical symptoms [2]. Healthcare providers' empathic
11 attitude toward patients is thought to be associated with good outcomes, such as
12 successful doctor-patient relationships and patient satisfaction [3].

13 In support of this, we demonstrated that a Communication Skills Training (CST)
14 intervention to improve oncologists' empathic communication, effective behaviours,
15 and confidence in their ability to communicate with patients decreased depression
16 symptoms among cancer patients [4]. Additionally, we conducted a review of cancer
17 patient preferences regarding the communication of bad news [5]. This confirmed that
18 empathy is considered the most critical factor in cancer medicine, particularly in Japan.
19 While the empathic attitude of healthcare providers involved in cancer care is important,
20 the contribution of psychological health also needs attention. Our research has revealed
21 that although the CST improved the confidence of Japanese oncologists to communicate
22 with patients, their emotional exhaustion also increased [6]. These findings are not just
23 relevant to cancer care, but apply more widely to the general practice of hospital
24 pharmacists.

25 The World Health Organization has defined pharmaceutical care as “a philosophy of
26 practice in which the patient is the primary beneficiary of the pharmacist’s actions” [7].
27 In 1993, the American Society of Health-System Pharmacists stated that
28 “pharmaceutical care is the direct, responsible provision of medication-related care for
29 the purpose of achieving definite outcomes that improve a patient’s quality of life, and
30 in the provision of pharmaceutical care, professional communication is essential” [8].
31 Some researchers have emphasized the importance of pharmacists having empathy and
32 communication skills. For example, Wallman et al. state that “the role of the pharmacist
33 as a communicator of information and advice between patients, other healthcare
34 practitioners, and the community is recognized as a vital component of a practicing
35 pharmacist” [9], and Berger suggests that “pharmaceutical care requires the formation
36 of a therapeutic alliance, and pharmacists will be able to treat patients more effectively
37 by their basic understanding and true desire to care for the patient” [10]. One study
38 reported that pharmacists who provided direct patient care scored higher on a measure
39 of caring ability than those who did not [11]. Another study concluded that the interplay
40 of empathic development and social learning in pharmacists appears to facilitate
41 empathic responding to patients who are experiencing physical or emotional distress
42 [12]. Recently, the need for education in empathy has been recognized. One recent
43 randomized prospective study was carried out to examine the effects of an empathy
44 intervention on pharmaceutical students; although the intervention increased empathy
45 levels, these effects were not sustained [13].
46 In 2009, the Japan Pharmaceutical Association published guidelines regarding the
47 professional standard required of pharmacists. In these guidelines, the importance of
48 pharmacists’ role in providing empathy, communication, and spiritual care to terminally

49 ill patients is mentioned. Though these requirements are quite recent, in current practice
50 in Japan, hospital pharmacists must directly communicate with cancer patients and are
51 expected to support patients, showing empathic concern and engaging in patient
52 counselling through drug guidance.

53 In the current study, we focused on autistic-like traits (ALTs) as a characteristic related
54 to both empathy and psychological distress in hospital pharmacists. ALTs restrict
55 intuitive social interaction, communication, and flexibility of interests and behaviours
56 [14]. Though autism spectrum disorder (ASD) and ALTs differ in severity, ALTs are
57 not a characteristic of ASD but could be seen as a milder form of ASD; that is, within
58 the spectrum of “normality” [15]. People with ASD display a classic triad comprising
59 impairments of social communication, social relationships, and imagination. Empathy
60 includes cognitive skills, which allow an understanding of the thoughts and feelings of
61 others, and emotional aspects, allowing the sharing of others’ feelings [16]. The relation
62 between ASD and empathy has been widely discussed. Recent evidence indicates that
63 people with ASD have difficulties with cognitive empathy, whereas the deficit in
64 affective empathy is specific for negative emotion [17]. However, Baron-Cohen claims
65 that people with ASD have difficulties with cognitive empathy, but not with emotional
66 empathy, and are able to care about others [18]. Perhaps ALTs also involve problems
67 with empathy. Furthermore, people with ALTs are also vulnerable to psychiatric
68 problems, such as depression [14]. To the best of our knowledge, the existence of ALTs
69 in healthcare providers has never been investigated.

70

71 **Aim of the study**

72 In this study, we aimed at examining the relationship in hospital pharmacists between
73 ALTs and empathy in a medical context, and between ALTs and psychological distress.
74 We tested two main hypotheses. First, we hypothesized that ALTs would inversely
75 influence empathic attitude in a medical context. Second, we predicted that ALTs would
76 inversely influence pharmacists' psychological health. Additionally, we predicted that
77 this association would be mediated mainly by various factors related to empathy, such
78 as perspective taking, empathic concern, and personal distress, and secondarily by other
79 ALT-related aspects, such as poor imagination or exceptional attention to detail.

80

81 **Ethical approval**

82 This study was approved by the Ethics Committee of the Okayama University Graduate
83 School of Medicine, Dentistry and Pharmaceutical Sciences on December 25, 2013
84 (receipt number 776).

85

86 **Method**

87 **Participants**

88 Eligibility criteria for inclusion were certified pharmacists working at hospitals for
89 patient care who provided informed consent for participation in this study. We
90 confirmed their consent by returning their answers. We contacted the pharmacy
91 representative of 154 hospitals to invite all pharmacists working at hospitals for patient
92 care and belonging to the Okayama Society of Hospital Pharmacists (officially reported
93 figure of 823, with a median of 11 years' experience after qualification as a pharmacist,
94 though $n = 10$ did not share this information) to participate in the study. We posted
95 self-administered questionnaires to participants and informed them in writing of the aim,

96 methods, risks, and benefits of the study. Participants were asked to complete the
97 questionnaires anonymously. With the approval of the Ethics Committee, we assumed
98 that the return of questionnaires constituted informed consent. We asked participants to
99 confirm that they engaged in direct patient care.

100 The Okayama Society of Hospital Pharmacists covers all areas of Okayama Prefecture,
101 which is located approximately 500 km west of Tokyo.

102

103 Procedures

104 Materials

105 *Demographics*

106 Participants initially completed questions about their demographic and professional
107 background, providing information about (a) age; (b) gender; (c) number of beds in the
108 hospital in which they worked; and (d) number of years since qualification as a
109 pharmacist.

110 *The Autism-Spectrum Quotient (AQ)*

111 People with ASD scored highly on the AQ compared with the control group [19]. The
112 AQ is composed of 50 items on a four-point Likert scale ranging from 1 (not at all) to 4
113 (very well) with a dichotomous scoring method (0-0-1-1) and a maximum score of 50.
114 There are five subitems including attention-switching, social skills, communication
115 skills, imagination, and local details [19]. The Japanese version of the AQ shows
116 remarkably similar results to those of the original among both the general population
117 and clinical groups. For the Japanese version of the scale, the cut-off point for ASD is
118 above 33 [20].

119 *The Jefferson Scale of Empathy (JSE)*

120 The JSE was developed by Hojat (2001) to measure empathy in the context of medical
121 education and patient care [21, 22]. Hojat suggests that perspective taking and empathic
122 concern, but not personal distress, are important in establishing an empathic attitude in a
123 medical context [23, 24]. Evidence in support of the JSE's construct validity [21, 23,
124 25], internal consistency reliability [21, 22, 25], and test-retest reliability [25] has been
125 reported for physicians. Two reports showed significant associations between JSE
126 scores and patient outcomes in diabetic patients (haemoglobin A1c, low-density
127 lipoprotein cholesterol, and acute metabolic complications) [26, 27]. The JSE includes
128 20 items on a seven-point Likert scale ranging from 1 (strongly disagree) to 7 (strongly
129 agree). Three versions of the JSE are available, with a version for physicians and other
130 health professionals (HP-Version), medical students (S-Version), and students in health
131 professions other than medicine (HPS-Version). These versions share similar contexts
132 and differ mainly in their subjects, such as "I" in the HP-Version, "Physicians" in the
133 S-Version, and "Healthcare providers" in the HPS-Version. Only the S-Version has
134 been validated for Japanese samples. The Japanese JSE (S-Version) has a similar factor
135 structure to that of the original and a Cronbach alpha coefficient of 0.80 [28]. In this
136 study, we amended "Physicians" to "Pharmacists" in each of the Japanese S-Version
137 questions. For example, "Pharmacists should try to stand in their patients' shoes when
138 providing care to them."

139 *The General Health Questionnaire-12 (GHQ-12)*

140 The General Health Questionnaire (GHQ) is a self-administered screening instrument
141 aimed at detecting individuals with a diagnosable psychiatric disorder [29]. The 12-item
142 General Health Questionnaire (GHQ-12) produced results comparable to longer
143 versions of the GHQ in a World Health Organization study of psychological disorders

144 in general healthcare [30]. In the present study, we used a four-point Likert scale
145 ranging from 0 (not at all) to 3 (very well) for correlation and mediation analyses,
146 because this scoring method produces a wider and smoother score distribution and
147 enough screening validity, with an area under the receiver-operating-characteristic curve
148 of 0.85, sensitivity of 78.9%, and specificity of 77.4% [30].

149 *The Interpersonal Reactivity Index (IRI)*

150 We used this scale to examine whether perspective taking, empathic concern, or
151 personal distress mediated the associations of the AQ with the JSE and GHQ-12. The
152 IRI was developed by Davis (1980) to separate the multiple dimensions of empathy into
153 four components. These are IRI-PT (Perspective Taking, the ability to adopt the
154 perspective of others), IRI-EC (Empathic Concern, the tendency to experience feelings
155 of compassion and sympathy for others' misfortune), IRI-PD (Personal Distress, the
156 tendency to feel uncomfortable about the distress of others), and IRI-FS (Fantasy Scale,
157 measuring the proclivity to identify with fictitious characters). The latter subscale was
158 not used in this study because it is not directly related to medical competency [31]. The
159 IRI-EC and IRI-PD are considered two independent measures of emotional empathy
160 focusing on self- and other-oriented sets of feelings, while the IRI-PT measures
161 cognitive aspects of empathy. Each subscale has seven items on a four-point Likert
162 scale ranging from 1 (not at all) to 4 (very well) [31]. The Japanese version was
163 evaluated with university students. The correlation coefficients between the subscales
164 and α coefficients were similar to those for the original, and this version correlates with
165 the Japanese version of the Questionnaire Measure of Emotional Empathy [32],
166 showing good reliability and validity. Following the methodology of previous research
167 studies, we did not sum the three subscale scores but treated them as independent scales.

168 *The Emotional Contagion Scale (ECS)*

169 We evaluated emotional empathy using the ECS, in addition to the IRI. We used the
170 ECS as an ancillary scale because, as previously mentioned, the association between
171 ALTs and emotional empathy is currently a topic of debate. The ECS evaluates the
172 likelihood of emotional contagion of five specific emotions in a particular scene (love,
173 happiness, anger, fear, and sadness) [33]. It comprises 15 items on a four-point Likert
174 scale ranging from 1 (not at all) to 4 (very well). The process of translating and
175 validating the scale resulted in a four-point response scale rather than the original
176 five-point scale [34].

177 Statistical analysis

178 All analyses were performed using IBM SPSS, version 22 (IBM Japan, Tokyo). Alpha
179 levels were set at $p < 0.05$ (two-tailed). The data were not normally distributed.

180 Correlations between variables were analysed using Spearman's coefficient for discrete
181 variables.

182 A subanalysis examined whether pharmacists with AQ scores above the cut-off point
183 scored lower on the JSE. To examine the association between AQ and psychiatric
184 morbidity, AQ was entered as an independent variable into a logistic regression analysis.
185 Cross-sectional research indicates that women show consistently more empathy than
186 men, and middle-aged adults show higher empathy than young adults [35]. Therefore,
187 our subgroup analysis included stratification analyses accounting for gender and median
188 of years after qualification. We used years after qualification instead of age because age
189 data for some participants were missing. Number of years after qualification was
190 strongly correlated with age.

191 We investigated the mediation effect of the IRI subscales on the relationship between
192 AQ and JSE/GHQ-12 to eliminate the possibility that the other characteristics of ALTs
193 (e.g., poor imagination or attention to local detail, which are evaluated by the AQ)
194 would strongly influence JSE scores. The sizes of the indirect effects of AQ on
195 JSE/GHQ-12 through IRI subscales were estimated using a bias-corrected bootstrapping
196 method [36] with 1000 replications. Bootstrap 95% confidence intervals (CIs) were
197 obtained. The outcome variable was JSE or GHQ, the independent variable was AQ
198 total score, and the mediators were IRI subscales (IRI-PT/EC for JSE, IRI-PD for
199 GHQ-12; see Figure 1). [INSERT FIGURE 1 HERE] We further controlled for gender
200 and years after qualification.

201 The present study was reported in accordance with guidelines outlined in the
202 STrengthening the Reporting of OBservational studies in Epidemiology (STROBE)
203 statement.

204

205 **Results**

206 All participants were certified pharmacists in Japan and were currently working in
207 hospitals for patient care (Figure 2). [INSERT FIGURE 2 HERE] Ninety-two hospitals
208 responded positively to our survey request and questionnaires were subsequently posted
209 to 437 pharmacists. Complete responses were obtained from 379 pharmacists, yielding a
210 response rate of 46%. A demographic summary of respondents is shown in Table 1
211 [INSERT TABLE 1 HERE]. There were 151 males (39.8%), with a mean age of $37.7 \pm$
212 10.8 years (missing data, $n = 13$) and a median of 11 years after qualification as a
213 pharmacist. Other data and descriptive statistics for questionnaire responses are shown
214 in Table 1.

215 Table 2 shows the results of the correlation analyses. AQ showed a significant inverse
216 correlation with JSE ($r = -0.22, p < 0.001$) and a significant positive correlation with
217 GHQ-12 ($r = 0.40, p < 0.001$). [INSERT TABLE 2 HERE] AQ had a significant but
218 weak inverse correlation with ECS ($r = -0.121, p = 0.019$). Pharmacists with AQ scores
219 higher than the cut-off point ($n = 13$) scored significantly lower on the JSE (98.15 vs.
220 109.23, Mann–Whitney U test, $p = 0.026$). AQ was significantly associated with
221 psychological distress (odds ratio 1.107, 95% confidence intervals 1.071–1.144, $p <$
222 0.001). Results stratified by the median of gender or median of years after qualification
223 were similar to those that were not stratified (data not shown).

224 Table 3 shows the results of the mediation analyses. In the models without mediation,
225 AQ showed a significant inverse path coefficient on JSE ($= c, p < 0.001$) and a
226 significant positive path coefficient on GHQ ($= C, p < 0.001$). In the models with
227 mediation, the bootstrap 95% CI of $a*b, d*e,$ and $A*B$ did not include zero, which
228 indicated that all the indirect effects in the model were significant. There were also
229 direct effects, with significant effects of AQ on JSE ($= c', p < 0.05$) and on GHQ ($= C',$
230 $p < 0.02$). [INSERT TABLE 3 HERE]

231 For confirmation, we performed the same analyses excluding 40 participants who
232 answered “no” to the question of interpersonal work to obtain similar results (data not
233 shown).

234

235 Discussion

236 This study shows significant relationships between pharmacists' empathic attitude in a
237 medical context and their ALT scores. Pharmacists with AQ scores higher than the
238 cut-off point displayed less empathic attitudes. Additionally, AQ was significantly

239 associated with psychological distress. Thus, pharmacists with high ALTs showed
240 decreased empathy and impaired psychological health. As expected, in our mediation
241 model, the ratios of path coefficients showed that 52.1% of the relation between AQ and
242 JSE was mediated by empathy subscales (perspective taking and empathic concern), and
243 24.8% of the relation between AQ and GHQ was mediated by empathy (personal
244 distress). This indicates that the associations revealed here are partly a result of factors
245 relating to empathy.

246 Our results indicated that overall emotional empathy (ECS), including items similar to
247 items in the IRI-EC and IRI-PD, had a significant but weak inverse correlation with AQ.
248 Consistent with previous research, this indicates that those with high ALTs may have
249 intact emotional empathy when IRI-EC and IRI-PD are not discriminated [37].

250 Pharmacists with high ALTs have biased empathy (low perspective taking, low
251 empathic concern, and high personal distress). Thus, they display weak cognitive
252 empathy but almost intact emotional empathy. However, the latter is biased to personal
253 distress. This biased empathy could cause two undesirable results: lower empathic
254 attitude in a medical context and higher risk of psychological problems.

255 We found an inverse correlation between AQ and JSE. This result is consistent with
256 previous research showing that people with ASD are unlikely to display empathic
257 behaviour [37]. Previous work suggests that individuals with ASD need to emotionally
258 regulate themselves to overcome strong personal distress, but often have weak emotion
259 regulation abilities [38]. This leads to a failure of appropriate empathic behaviour and to
260 psychological distress when they are forced to act prosocially. This finding is consistent
261 with our results, which indicate a positive correlation between AQ and GHQ-12.

262 It has been suggested that the key skills necessary for oncologists engaged in
263 patient-centred medical care, such as exploring patients' perspectives and responding to
264 emotion with empathy, can be learned through interventions like CST [39]. Additional
265 interventions exist that can improve physicians' empathic behaviour. For example,
266 emotion regulation skill training can improve empathic behaviour when personal
267 distress causes negative emotions [40]. On a different note, some research shows that
268 reading literary fiction improves the skill of understanding the mental states of others
269 [41]. There have been attempts to introduce literature to medical education programs to
270 promote empathy among physicians [42]. Such interventions for improving deficits in
271 understanding patients' perspectives may also be helpful for those with high ALT
272 levels.

273 Our results indicate a need to develop specialized interventions for medical staff with
274 high ALT levels to reduce their psychological distress. One survey of primary care
275 physicians reported improvement in empathic attitude and psychological health
276 following an educational program for mindfulness [43]. Similarly, a controlled study
277 demonstrated that adult patients with ASD suffering from anxiety and depression
278 symptoms benefit from mindfulness-based therapy, although the targeted population
279 was not medical staff [44]. Another study examined the effectiveness of a cognitive
280 behavioural intervention program for ALTs characterized by psychological distress
281 deriving from social deficits [45]. Thus, we believe that CST and mindfulness training
282 would increase JSE scores and that mindfulness training and CBT would decrease GHQ
283 scores.

284 Compared with scores in previous studies [19-22], the mean AQ and JSE scores in this
285 study were within normal range, suggesting that no intervention is necessary for these

286 participants. Nevertheless, we believe that effective patient care requires a more
287 empathic attitude. However, the findings of one RCT that a CST targeting residents and
288 nurses with little experience resulted in a slight increase in patients' depressive
289 symptoms [46] suggests that the success of interventions to increase empathy may
290 depend on the type of subjects (and on the presence of ALTs, as the present findings
291 indicate). Thus, we need to determine appropriate targets of effective interventions.
292 Our study has some limitations. First, this was a cross-sectional study. Therefore, the
293 causality between variables cannot be definitely determined. Second, the response rate
294 was less than 50%, perhaps because the 118-item questionnaire was too large; as such,
295 there may have been selection bias. However, given that the received responses were
296 anonymous, the possibility of reporting bias may be considered low. Third, the JSE is a
297 self-administered questionnaire and although it is used worldwide to examine the
298 empathic attitude of various medical professionals, future observational research of
299 pharmacist behaviour and patient outcomes is needed. Fourth, a single question was
300 perhaps insufficient to confirm that hospital pharmacists really engaged in direct patient
301 care, and this question might have been difficult for respondents to interpret. Finally,
302 the generalizability of the present study to the rest of the world may be limited because
303 our participants were drawn from a specific area in Japan. Additionally, this study was
304 performed to reflect mainly the oncology care situation in Japan; thus, the external
305 validity of our findings for other countries may be limited.

306

307 **Conclusion**

308 For pharmacists required to engage in empathic behaviour in a medical context, ALTs
309 may affect empathic attitude, which in turn may affect patient outcome. ALTs may also

310 affect pharmacists' own psychological health. While interventions such as CST can
311 improve empathic attitude, our results suggest caution when using these with people
312 with high ALT levels. We should consider whether these interventions improve
313 empathic attitude in those with high ALT levels, and whether enhancement of empathic
314 behaviour increases psychological distress, especially in this group. The development of
315 more specific interventions may be helpful for some individuals.

316 **Acknowledgements**

317 The authors thank the Okayama Society of Hospital Pharmacists for study participation,
318 and all the participants. The authors thank Akio Wakabayashi for permission to use the
319 Japanese AQ. The authors express their gratitude for the enormous help of Shoko
320 Yoshimoto for fund management and Yifei Tang and Kyoko Hageshita for excellent
321 data management.

322

323 **Funding**

324 This study was supported by the Research for Promotion of Cancer Control
325 Programmes (H26-Gan Seisaku-ippa-002 and H25-Seishin-ippa-001) Health and
326 Labour Sciences Research Grants from the Ministry of Health, Labour and Welfare,
327 Japan.

328

329 **Conflict of interests**

330 The authors declare that they have no conflicts of interest.

331

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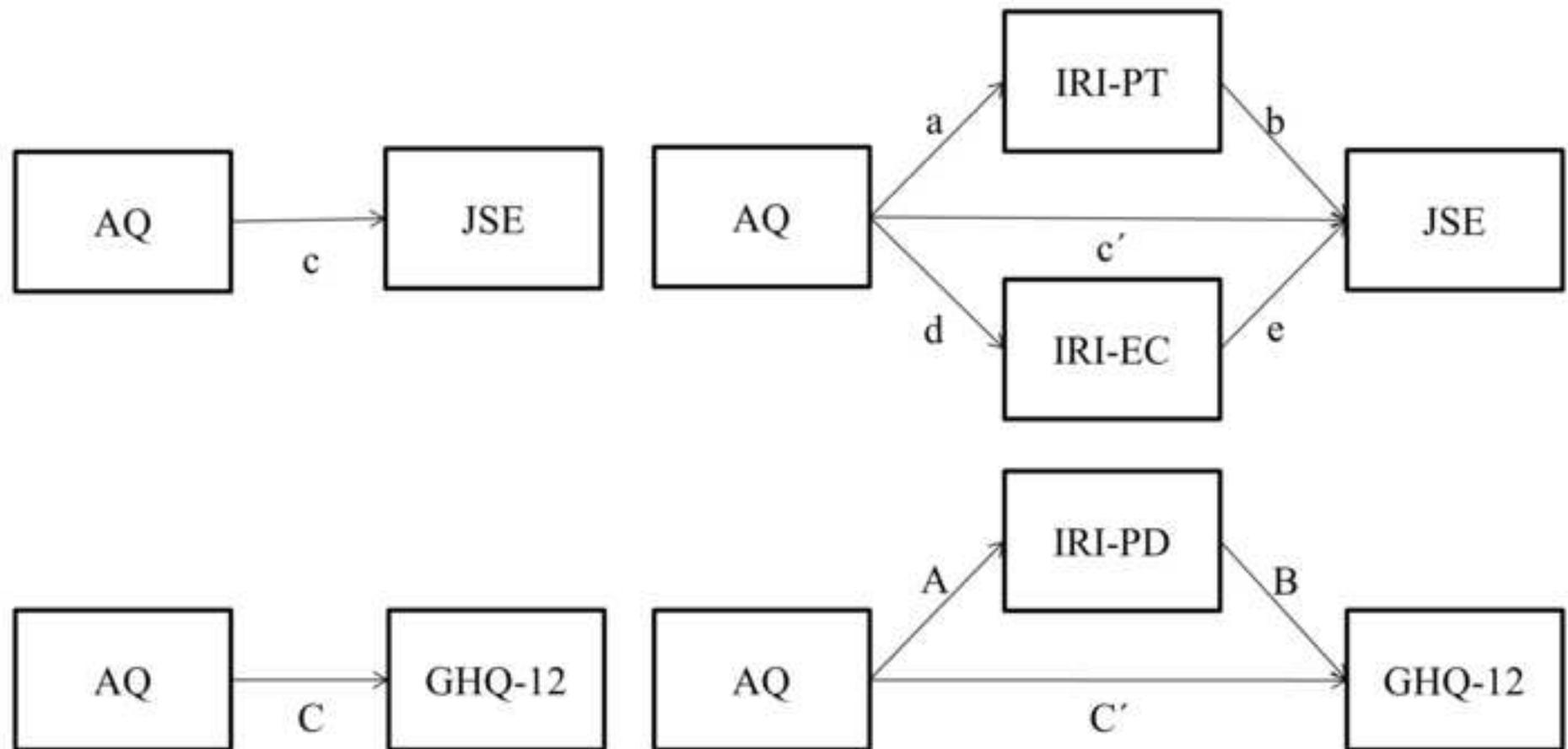
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455

Figure1. Illustration of the mediation model



AQ: The Autism-Spectrum Quotient; JSE: The Jefferson Scale of Empathy
GHQ-12: The General Health Questionnaire-12
IRI: The Interpersonal Reactivity Index
PT: Perspective Taking; EC: Empathic Concern; PD: Personal Distress

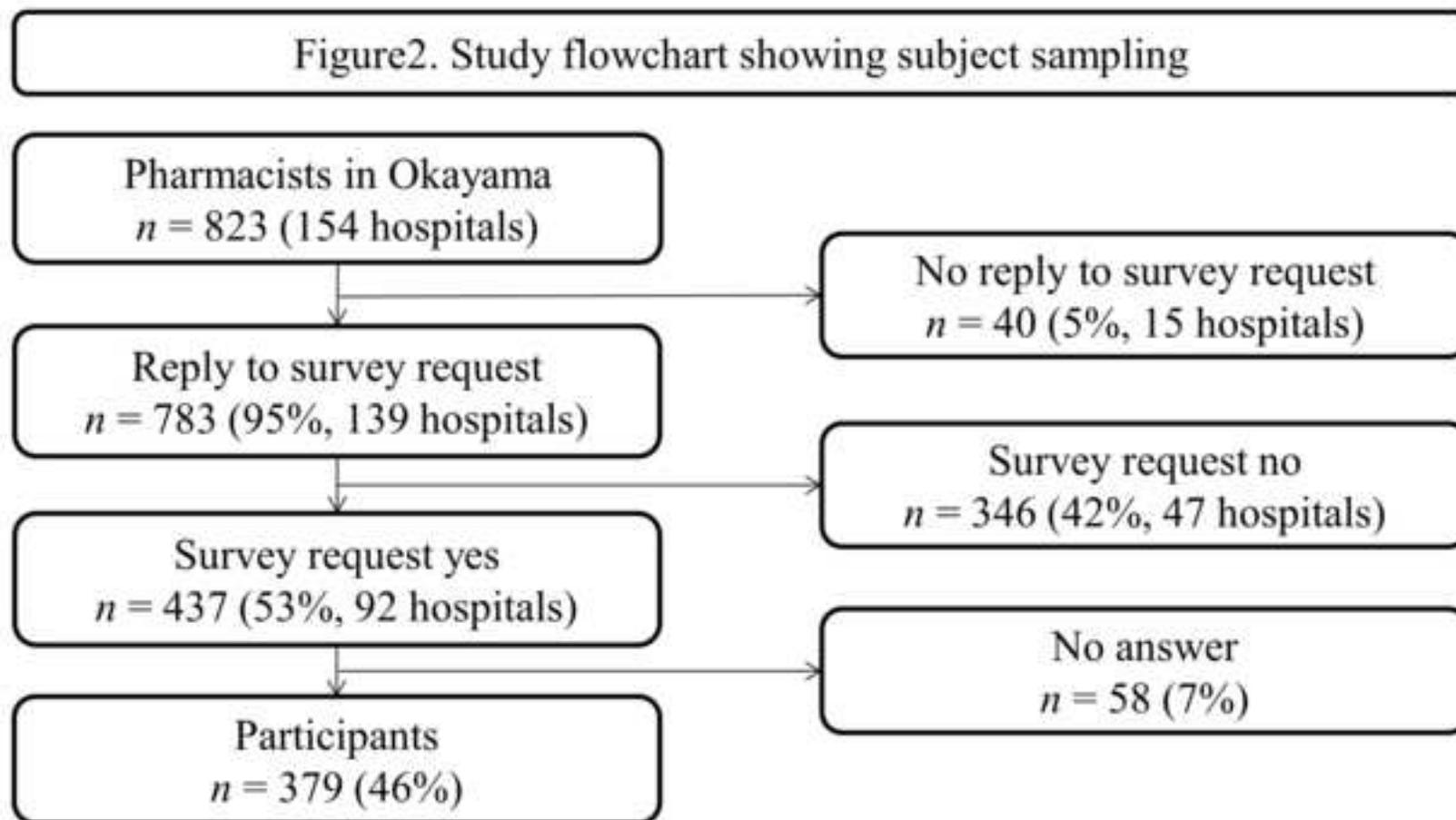
Figure.1

Title: Illustration of the mediation model

Legend: The model hypothesizes that the Autism-Spectrum Quotient exerts an indirect effect on the Jefferson Scale of Empathy and the 12-item General Health Questionnaire through Interpersonal Reactivity Index subscales (Interpersonal Reactivity Index-Perspective Taking/Empathic Concern/Personal Distress). Path c represents the effect of the Autism-Spectrum Quotient on the Jefferson Scale of Empathy without indirect path. Path a represents the effect of the Autism-Spectrum Quotient on Interpersonal Reactivity Index-Perspective Taking. Path b represents the effect of Interpersonal Reactivity Index-Perspective Taking on the Jefferson Scale of Empathy partialling out the effect of the Autism-Spectrum Quotient. Path $c' (= c - a*b - d*e)$ is the direct effect of the Autism-Spectrum Quotient on the Jefferson Scale of Empathy. The indirect effect of the Autism-Spectrum Quotient on the Jefferson Scale of Empathy through Interpersonal Reactivity Index-Perspective Taking/Empathic Concern is $a*b$ and $d*e$, which is tested with the bootstrap confidence interval obtained through the bootstrapping method.

Path C represents the effect of the Autism-Spectrum Quotient on the 12-item General Health Questionnaire without indirect path. Path A represents the effect of the Autism-Spectrum Quotient on Interpersonal Reactivity Index-Personal Distress. Path B represents the effect of Interpersonal Reactivity Index-Personal Distress on the 12-item General Health Questionnaire partialling out the effect of the Autism-Spectrum Quotient. Path $C' (C - A*B)$ is the direct effect of the Autism-Spectrum Quotient on the 12-item General Health Questionnaire. The indirect effect of the Autism-Spectrum Quotient on the 12-item General Health Questionnaire through Interpersonal Reactivity

Index-Personal Distress is $A*B$, which is also tested with the bootstrap confidence interval.



1 **Figure 2**

2 Title: Study flowchart showing subject sampling

3 Legend: (none)

4

Table 1. Demographic summary and descriptive statistics for questionnaire responses					
	Participants (n = 379)				
Gender	n	%			
Men	151	39.8			
Women	228	60.2			
	Mean	Median	SD	Range	
Age^a (years)	37.3	34	10.8	[24–66]	
Years after qualification	13.6	11	11.3	[0–44]	
Years after qualification ^b	14.1	11	12.2	[0–50]	
Hospital beds					
<100	33	8.7			
100–500	184	48.5			
>500	162	42.7			
Questionnaire results					Full range
AQ	19.7	19	7.3	[5–41]	[0–50]
JSE	108.9	109	12.5	[58–140]	[20–140]
GHQ-12 (Likert score)	14.8	14	4.8	[2–32]	[0–36]
IRI-Perspective Taking	20.2	20	3.1	[9–28]	[7–28]
IRI-Empathic Concern	19.9	20	2.9	[8–28]	[7–28]
IRI-Personal Distress	16.3	16	2.5	[10–24]	[7–28]
ECS	40.1	40	5.4	[23–60]	[1–60]
AQ: The Autism-Spectrum Quotient					
JSE: The Jefferson Scale of Empathy					
GHQ-12: The 12-item General Health Questionnaire					
IRI: The Interpersonal Reactivity Index					
ECS: The Emotional Contagion Scale					
^a n = 13, data missing; ^b officially reported data (n = 813)					

Table 2. Results of correlation analyses							
	1	2	3	4	5	6	7
1:AQ	1						
2:JSE	-0.221**	1					
3:GHQ-12	0.419**	-0.123*	1				
4:IRI-Perspective Taking	-0.305**	0.309**	-0.053	1			
5:IRI-Empathic Concern	-0.298**	0.309**	-0.103	0.352**	1		
6:IRI-Personal Distress	0.462**	-0.076	0.436**	-0.174**	0.037	1	
7:ECS	-0.121*	0.255**	0.016	0.183**	0.338* *	0.186**	1
AQ: The Autism-Spectrum Quotient							
JSE: The Jefferson Scale of Empathy							
GHQ12: The 12-item General Health Questionnaire							
IRI: The Interpersonal Reactivity Index							
ECS: The Emotional Contagion Scale							
** $p < 0.001$, * $p < 0.05$							

Table 3. Regression coefficients between variables in the mediation models

Association Between AQ and JSE					
	c	c' (= c-a*b-d*e)	a	b	a*b, [Bootstrap 95% CI]
AQ on JSE	-0.4378*	-0.2096*	-0.135**	0.7258**	-0.0980, [-0.1739 to -0.0464]
			d	e	d*e, [Bootstrap 95% CI]
			-0.1229**	1.0587**	-0.1301, [-0.2323 to -0.0617]
Association Between AQ and GHQ-12					
	C	C' (= C-A*B)	A	B	A*B, [Bootstrap 95% CI]
AQ on GHQ-12	0.2696**	0.2027**	0.1506**	0.4443**	0.0669, [0.0332 to 0.1031]
AQ: The Autism-Spectrum Quotient					
JSE: The Jefferson Scale of Empathy					
GHQ-12: The 12-item General Health Questionnaire					
** $p < 0.001$, * $p < 0.05$					
Indirect effects of receiving AQ on JSE and GHQ-12 through IRI subscales were estimated, controlling for sex and years after qualification; bootstrap 95% CIs were obtained through the bootstrapping method evaluating these indirect effects. Regression coefficients (a, b, c, c', d, e, A, B, C, C') are illustrated in Figure 2.					