

1 **Task sharing clubfoot treatment in Latin America: a cross-sectional survey of expert**
2 **opinions**

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7

8 **Abstract**

9 While the Ponseti method has quickly become the mainstay of clubfoot treatment in most
10 parts of the world, its dissemination and successful implementation in Latin America has been
11 more limited. The additional shortage of orthopedic surgeons in this region makes task sharing a
12 practical approach to address gaps in service provision. We designed an online survey to assess
13 needs, perceptions, and willingness to task share the delivery of the Ponseti method by Ponseti-
14 method-trained physicians across Latin America. Multiple-response questions were summarized
15 and an applied thematic analysis approach was used to analyze free-response questions. We
16 achieved a 66% response rate (31 of 47 experts responded). Our findings illustrate that most
17 physicians feel the need for disseminating and improving Ponseti training, as well as having
18 additional support for clubfoot treatment. While physicians who treat clubfoot have mixed
19 opinions on the role of nonphysicians treating clubfoot, most report logistical concerns and
20 insufficient training as barriers to their inclusion. Given this and the need for improved, more
21 accessible clubfoot care across Latin America, future clubfoot treatment efforts may benefit from
22 incorporating task sharing between orthopedic surgeons and non-physician personnel.

23

24 **Introduction**

25 Clubfoot, defined as the downward- and inward-turning of the foot, is one of the most
26 common musculoskeletal birth deformities in the world (1). When left untreated, clubfoot may
27 cause lifelong physical impairment, social isolation, and economic deprivation. The global
28 paradigm for management of clubfoot has shifted from the provision of extensive surgical

29 correction to implementation of a minimally-invasive, conservative correction that is both low-
30 cost and highly-effective; this technique is called the Ponseti method (2).

31 The Ponseti method, created by Dr. Ignacio Ponseti, involves a correction and a
32 maintenance phase (3). The correction phase comprises serial manipulations with simultaneous
33 correction of the four components of the deformity: cavus, adductus, varus, and equinus. A series
34 of long-leg plaster of Paris casts hold the corrected foot position, usually followed by an
35 outpatient Achilles tenotomy. Immediately after the removal of the final cast, the corrected foot
36 is placed in a foot abduction brace (FAB) with the aim of preventing recurrence. The FAB
37 should be worn 23 hours a day for the first three months and then only at night until the age of
38 four years; the FAB itself is changed as the child's foot grows. Both the maintenance and
39 correction phases are equally important for success of clubfoot management. Although success
40 rates of the Ponseti method vary based on when treatment is initiated, patient adherence, and
41 provider experience, complete correction can be achieved in the majority of patients with success
42 rates as high as 95% (4).

43 While the Ponseti method has quickly become the mainstay of clubfoot treatment in most
44 parts of the world – US, UK, Australia, India, and parts of Africa – its dissemination and
45 successful implementation in Latin America has been slower (4). Despite clubfoot being reported
46 as one of the most commonly encountered pediatric orthopedic conditions in parts of Latin
47 America, when compared with patients in higher income nations, patients have a later age of
48 presentation, more time spent in the manipulation and casting phase, lower rates of tenotomy,
49 and higher rates of relapse (5, 6). Inefficient healthcare systems may be partly responsible for
50 this inequity and shortage of trained orthopedic surgeons additionally contributes to barriers to

51 care (4, 7-9). Similar to other specialty services, most orthopedic professionals work in urban
52 population centers, further disadvantaging patients in rural areas.

53 Although training more orthopedic surgeons appears to be the most straightforward
54 solution, this task requires intensive resources, time, and effort, making it an unrealistic short-
55 term plan (10). Instead, more radical reform of specialist services is needed, particularly where
56 decentralization or integration of services into primary care is necessary to improve access to
57 care and achieve universal health coverage. Task sharing is one practical approach to addressing
58 such gaps in human resources; it involves teaching competencies previously held by specialists
59 to other personnel (11, 12). Originally created by the Lancet Commission on Global Surgery
60 (LCoGS), task sharing – a practice whereby nonsurgeon professionals and clinicians are trained
61 to do simple procedures, whilst having access to surgical professionals who normally do said
62 procedures – is commonly used both in high- and low-resource settings, having been found to be
63 safe and cost-effective (10). In clubfoot treatment, findings from Malawi illustrate that non-
64 physician staff who received training in the Ponseti method were at least as effective as
65 physicians (13). Similar findings were found in Nepal, Vietnam, United States, United Kingdom,
66 and Canada (13-18). Moreover, treatment by physiotherapists in the United Kingdom provided
67 lower rates of additional treatment (14% vs. 26%, $p=0.075$) as well as a lower rate of additional
68 procedures (6% vs. 18%, $p=0.025$) when compared to physician-directed groups (17).

69 Despite the promising data available on the use of nonphysician personnel to implement
70 the Ponseti technique and the shortage of orthopedic surgeons in Latin America, no literature
71 exists on task sharing the Ponseti method for the Latin America region. Given the cost-
72 effectiveness of the Ponseti method, the barriers identified by physicians and caregivers, and the
73 shortage of orthopedic surgeons in Latin America (4, 7, 8), this study aims to answer two

74 questions: (1) Do non-physician personnel (e.g. physical therapists, nurses, etc.) have a role in
75 treating clubfoot, such as assisting with manipulation and casting, providing education, or other
76 tasks? and (2) what are the perceptions and attitudes from Ponseti-trained physicians regarding
77 nonphysician providers implementing (i.e. task sharing) the Ponseti method?

78

79 **Materials and methods**

80 **Ethics**

81 This study was determined to be exempt from Interview Review Board approval by the
82 Columbia University Administrative Review Committee (IRB-AAAS3714).

83

84 **Study and questionnaire**

85 The survey in this study was designed to assess needs, perceptions, and willingness to
86 task share the Ponseti method by Ponseti-trained physicians across Latin America. It consisted of
87 17 questions, including multiple response and free-response questions (see Appendix 1). All
88 questions were reviewed by the contributing authors. Questions were translated to Spanish by a
89 native speaker and read by other native Spanish speakers for clarity. Questions were uploaded to
90 Qualtrics, an online survey platform.

91 Basic demographics such as occupation, country of employment, age, and gender were
92 recorded. Questions to gauge experience with treating clubfoot were asked, such as how
93 participants were trained, length of time treating clubfoot, and their monthly estimate of new
94 clubfoot patients in their clinic. Adherence to and success rates of the Ponseti method were
95 evaluated for each provider through questions about percentage of clubfoot patients completing

96 casting and/or bracing and rate of patients receiving a tenotomy. Participants were asked in a
97 multiple response question to identify barriers to implementing the Ponseti method, and these
98 barriers were divided into ten categories (Table 2). Participants were asked to rank, on a five-
99 point Likert scale, the extent to which they agreed with several statements regarding time,
100 resources, and attitude towards teaching patients about clubfoot. Participants were additionally
101 asked to identify collaborators for implementing the Ponseti method (Table 3), and were given
102 the opportunity to elaborate in a free-response question on nonphysician staff collaboration with
103 physicians. They were asked to share their opinion of nonphysician staff having a role in treating
104 clubfoot, and then asked to elaborate in a free-response question. A final, open-ended question
105 asking for further suggestions for improving clubfoot treatment was included.

106

107 **Participants and study procedures**

108 A list of physicians with known experience in clubfoot treatment was obtained from an
109 international non-profit organization. Participants were contacted via email a total of three times
110 at one-week intervals.

111 Surveys were distributed to 47 practitioners using the Qualtrics platform from April 2019
112 to June 2019. All survey responses were anonymous.

113

114 **Statistical analyses**

115 Multiple-response questions were summarized and graphed using Qualtrics. An applied
116 thematic analysis approach was used to draw results from free-response questions. An initial

117 code structure was devised for each free-response question and applied systematically to each
118 free-text response.

119

120 **Results**

121 **Demographics**

122 Thirty-one practitioners responded to the online survey, yielding a response rate of 66%
123 and including 29 orthopedic surgeons, one pediatrician, and one unspecified physician.

124 Participants were recruited from eight countries as outlined in Table 1. The average age of
125 respondent was 40 years, with 71% of respondents being male. All participants had been trained
126 in the Ponseti method. Most had been formally trained in residency (n=19, 38%) and/or a formal
127 workshop (n=18, 36%). Some had one-on-one training from orthopedic surgeons (n=5, 10%) and
128 two (6%) were exclusively trained in this manner, one by Dr. Ponseti himself. Four physicians
129 (8%) supplemented their training with online resources, while only one participant (3.2%)
130 exclusively used online resources for training.

131 **Table 1. Demographics.**

	N	%
Country		
Bolivia	4	13%
Brazil	1	3%
Ecuador	6	19%
Guatemala	10	32%
Mexico	2	7%
Nicaragua	2	7%
Panama	1	3%
Paraguay	5	16%
Gender		
Female	9	29%
Male	22	71%

Average Age	40
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132

133 **Experience with treating clubfoot and clubfoot practices**

134 The majority of physicians reported treating clubfoot for greater than five years (n=16,
135 51.6%), with several physicians (n=10, 32.3%) with 2-5 years of experience and some (n=5,
136 16.1%) with < 2 years of experience. Over half of the physicians (n=17, 54.8%) reported treating
137 between 0 and 3 new clubfoot patients a month, while several (n=12, 38.7%) reported between 4
138 and 10 new clubfoot patients a month and only two (6.5%) reported more than 10 a month. The
139 majority of physicians (n=21, 67.7%) reported that, within the past year, more than two-thirds of
140 their patients completed the casting phase; eight (25.8%) reported a fraction between one-third
141 and two-thirds and only two (6.5%) reported a fraction of less than one-third. Most respondents
142 (n=17, 54.8%) reported a rate of over two-thirds for completing both casting and bracing; eight
143 (25.8%) reported a rate between one-third and two-thirds and the remaining (n=6, 19.4%)
144 reported a completion rate of less than one-third. The majority (n=22, 70.1%) reported that over
145 two-thirds of patients obtained a tenotomy; seven respondents (22.6%) reported a rate between
146 one- and two-thirds and the remainder (n=2, 6.5%) reported a rate of less than one-third.

147

148 **Barriers to implementing the Ponseti method**

149 The majority of physicians (n=25, 80.6%) agreed or somewhat agreed with the statement,
150 “I have all the material resources that I need to implement the Ponseti method” (Fig 1). The
151 remaining disagreed or somewhat disagreed (n=6, 19.4%). Similarly, the majority of physicians
152 (n=26, 83.9%) agreed or somewhat agreed that physicians have enough time to successfully
153 implement the Ponseti method; four (12.9%) disagreed or somewhat disagreed and one (3.2%)

154 was neutral (Fig 2). All agreed or somewhat agreed with the statement that teaching caregivers,
155 parents, and patients is an important part of the physician's job.

156

157 **Fig 1. Count of responses to "I have all the material resources that I need to implement the**
158 **Ponseti method."**

159 **Fig 2. Count of responses to "I have the time necessary to successfully implement the**
160 **Ponseti method, including the casting phase."**

161

162 Common barriers to clubfoot treatment are reported in Table 2. For this multiple response
163 question, physicians identified an average of 2.8 barriers, the most common being that parents
164 stopped using the brace, (n=23, reported by 74.2% of physicians).

165

Table 2. Reported barriers to clubfoot treatment

Answer	Count of Physicians Who Chose Response	Percentage of Physicians Who Chose Response
Parents stopped using brace	23	74.2
Failure of patients to return to clinic	18	58.1
Lack of or difficulty obtaining braces	14	45.2
Cost of treatment to the patient	12	38.7
Lack of or inadequate casting materials	6	19.4
Insufficient reimbursement to physicians	5	16.1
Inadequate training in Ponseti method	5	16.1
Inability of child to tolerate bracing	2	6.5
Insufficient reimbursement for cost of supplies	2	6.5
Insufficient reimbursement to other staff	1	3.2
Total Responses	88	

166

167 **Role of nonphysician staff in clubfoot treatment**

168 Most physicians reported collaborating with others to treat clubfoot, most commonly other
169 orthopedic surgeons, nurses, physical therapists/physiotherapist, general practitioners, and
170 medical assistants (Table 3).

171 **Table 3: Number of physicians identifying the following staff members as**
 172 **collaborators for treatment**
 173

Answer	Count of Physicians Who Chose Response	% of Physicians Who Chose Response
Orthopedic surgeons	17	54.8
Nurses	13	41.9
Physical therapists / Physiotherapists	9	29
General Practitioners	8	25.8
Medical Assistants	8	25.8
Cast Technicians	4	12.9
Occupational Therapists	3	9.7
Nurse practitioners	2	6.62
Clinical officers / Clinical assistants	1	3.2
Social Workers	1	3.2
No one	1	3.2

174

175 Free text responses to how assistants collaborate with surveyed physicians had several
 176 recurring, major themes. The most prevalent theme (n=17, 54.8%) was that staff members assist
 177 with cast application and/or cast removal. One physician added, “I work with a cast technician
 178 and nurse. They help me with the treatment...I show them the [Ponseti] method” [Participant
 179 24], illustrating an apprenticeship-like model between the physician and their assistants. The
 180 other prominent theme (n=13, 41.9%) that arose is that educating caregivers is fundamental. One
 181 participant stressed, “The education of parents about the regimen of the plaster and the bracing
 182 stage is extremely important” [Participant 26]. Only two (6.5%) participants commented on the
 183 importance of non-physician staff assisting by obtaining casting and bracing supplies.

184 Fourteen surveyed physicians (45%) believe there is a role for nonphysician staff in
 185 clubfoot treatment, while 13 (42%) did not believe there was an appropriate role, and four
 186 (12.9%) were unsure (Fig 3). Of physicians who do believe nonphysician staff have a role, the

187 most prominent theme (n=10, 32.3%) that emerged from free-text explanations was that there is
188 a need for collaboration when implementing the Ponseti method:

189

190 *“For the casting, two are required...” – [Participant 23]*

191

192 *“It is a teamwork. The success of a good plastering will also depend on the collaboration
193 between plasterers.” – [Participant 19]*

194

195 Other physicians expanded on this idea, stressing the need for professionals outside of orthopedic
196 surgery:

197

198 *“The treatment involves a lot of factors beyond simple corrections of the deformity...It
199 requires solutions/alternatives of various areas beyond medicine.” – [Participant 20]*

200

201 *“...This treatment requires an integral approach, therefore several professionals in
202 health are involved, as well as administrative...” – [Participant 11]*

203

204 In addition, some physicians (n=3, 9.7%) elaborated on the assistance non-physicians can
205 provide in educating patients about clubfoot. One participant (3.2%) stated that “it’s important
206 that each of the people who are interested in the method...those that form any part of medical
207 careers...receive the appropriate training” [Participant 24], advocating for the dissemination of
208 the Ponseti method for all healthcare practitioners who wish to learn. Two respondents (6.5%)
209 commented on how nonphysician staff can assist with building rapport with patients, such as

210 “providing assistance in doubts about the treatment or difficulties presented” [Participant 32] or
211 “extend[ing] contact with parents and follow-up” [Participant 23].

212

213 **Fig 3. Percentage of responses to "Is there a role for paramedical staff in treating**
214 **clubfoot?"**

215

216 Physicians who felt there was no role for nonphysician staff in treating clubfoot had
217 responses that mostly focused on the theme of logistical matters (n=9, 29%). Three respondents
218 (9.7%) explicitly stated that they were understaffed and did not have assistants, while others
219 (n=4, 12.9%) focused more on systematic barriers:

220 *“The system doesn't allow for it.” – [Participant 7]*

221

222 *“[there is] lack of coordination within the health network” – [Participant 6]*

223

224 *“...in the hospital where I work, nursing is not allowed to help in these types of*
225 *procedures, even if they are needed.” – [Participant 12]*

226

227 *“I schedule the appointment of my patients.”” – [Participant 30]*

228

229 Two participants (6.5%) focused on the challenges that arise from inconsistent placement of
230 auxiliary personnel, stating that “there is no specific role for personnel since they take turns
231 rotating through different services every month” [Participant 26]. Only one participant (3.2%)
232 explicitly stated that implementing the Ponseti method should be strictly limited to doctors.

233 Of the physicians that were unsure of the role of nonphysician staff in treating clubfoot
234 (n=4, 12.9%), some (n=2, 6.5%) reported uncertainty because there were no assistants available
235 in their hospital and/or they were unfamiliar with the nonspecific essential function of
236 nonphysician practitioners. Others (n=2, 6.5%) commented on the commitment and
237 responsibility needed from nonphysician staff.

238 The most prominent theme that emerged from participants' responses for how clubfoot
239 treatment could be improved in their country was improving the diffusion of Ponseti training
240 (n=18, 58.1%). In specific, some physicians called for "continuous training" [Participant 24] in
241 addition to training being "taught in an organized manner" [Participant 30]. Some physicians
242 (n=5, 16.1%) additionally called for changes at the healthcare system level that would assist in
243 the diffusion of the Ponseti method by, for example:

244 *"...train[ing] at the primary care level to recognize clubfoot that requires the Ponseti*
245 *method...creat[ing] new Ponseti Clinics and includ[ing] them in the Ministry of Health*
246 *programs."* – [Participant 23]

247

248 *"...implementing [Ponseti] in the national pediatric care program...[as] it should be*
249 *part of the evaluation and comprehensive management of child's health"- [Participant*
250 *19]*

251

252 *"...establish[ing] an efficient flow (order) of taking people or things to the treatment*
253 *center..."- [Participant 20]*

254

255 “...demonstrating the results, making them public...mak[ing] it possible to have the
256 Ministry of Health commit to the treatment” [Participant 21]

257

258 Similar to providing better, more systemically available training on the Ponseti method, another
259 major theme (n=7, 22.6%) was that a greater quantity of personnel for treating clubfoot is
260 needed. For example, one physician commented that they “have to make time to practice the
261 Ponseti method” [Participant 27] since they are responsible for all urgent cases presenting to
262 their hospital, illustrating that no other personnel are available to do both. Another participant
263 stressed how “it would be ideal to be able to count on a nursing staff for consultations”
264 [Participant 13]. These comments reiterate the need for additional staff for clubfoot care.

265

266 **Discussion**

267 This study is the first survey to assess the role of, and orthopaedic surgeon’s attitudes
268 towards, task sharing the Ponseti method in Latin America. Our results illustrate that physicians
269 are equally divided on whether there is a role for nonphysician staff in clubfoot treatment, with
270 most who are unsure or doubtful indicating primarily logistical concerns (e.g. the quantity of
271 nonphysician assistants and the quality of their training) as barriers. However, there is consensus
272 amongst the providers for disseminating and improving the Ponseti training in order to expand
273 access to clubfoot treatment.

274 With new methods of information dissemination such as low-bandwidth training sessions
275 on cellphones, mHealth applications, and nationwide training programs (e.g. Brazil’s
276 standardized, national “Ponseti Brazil” workshops), clubfoot patient volume and services are
277 likely to increase (19, 20). However, the current volume of orthopedic surgeons in Latin America

278 trained in the Ponseti method will unlikely be able to deliver and maintain high-quality clubfoot
279 treatment with this increasing demand for services. Our results illustrate that many physicians
280 see at least one child with clubfoot weekly; while this is a small number, the chronicity and
281 natural progression of clubfoot multiplies the effect that one clubfoot patient has when compared
282 to acute, non-progressive conditions.

283 An additional finding from this survey is that there is low caregiver compliance with
284 bracing and high rate of failure to return to clinic. Both findings act as major barriers to treatment
285 and have been mirrored in previous studies (4, 7, 8). Studies from New Mexico and New
286 Zealand, for example, have found that lack of adherence with bracing is the largest risk factor for
287 clubfoot recurrence (21, 22). Nonphysician providers trained in the Ponseti method could
288 potentially improve bracing adherence through, for example, home visits, for patients who need
289 bracing care. Nonphysician providers thus could provide a supplemental and novel role in task
290 sharing clubfoot care, and their involvement could facilitate both treatment and prevention of
291 recurrence. Moreover, as patient education was routinely listed as one of the main barriers to
292 successful treatment, Ponseti-trained nonphysician personnel could facilitate the spread of the
293 Ponseti method and expand access to treatment by educating and empowering patients and their
294 caregivers to receive optimal care (5, 7, 8). In short, sharing the task of providing caregiver
295 education may alleviate the burden disproportionately placed on a scarce supply of orthopedic
296 surgeons.

297 The results from this survey demonstrate that some physicians are amenable to having
298 nonphysician staff assist in clubfoot treatment. We conclude that nonphysician personnel may
299 provide human resources to fill the growing clubfoot treatment gap. While ensuring resources are
300 not diverted away from surgical specialists, adequate support and training are needed in task

301 sharing to ensure that (1) quality of care is maintained and that (2) the task sharing initiative can
302 be scaled up adequately (10). Still, training alone is not enough; continued supervision is needed
303 to ensure that non-specialist staff are confident in their tasks, carrying them out to a high quality
304 and being able to ask questions as necessary. Adequate recognition and remuneration are
305 additionally important to maintain motivation for non-specialist staff in carrying out their new
306 tasks. Ultimately, task sharing – for the Ponseti method or any other clinical treatment – requires
307 clear communication and mechanisms to support monitoring, supervision and evaluation.

308

309 **Strengths and limitations**

310 Strengths of this study include the geographic diversity of the physicians that provided
311 data, which may allow for broad implications of the results. Survey anonymity additionally adds
312 to the quality and subjectivity of the data collected. Study limitations include having a small
313 study sample size, in addition to potential selection bias given the mode of survey distribution
314 (e.g. online, via email).

315

316 **Conclusion**

317 In Latin America, many clubfoot treatment providers report collaborating with non-
318 physicians to implement the Ponseti method. While physicians who treat clubfoot have mixed
319 opinions on the role of nonphysicians treating clubfoot, most report logistical concerns and
320 insufficient training as barriers. Given this and the need for better, more accessible clubfoot care
321 across Latin America, future clubfoot treatment efforts may benefit from incorporating task
322 sharing between orthopedic surgeons and non-physician personnel.

323

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326

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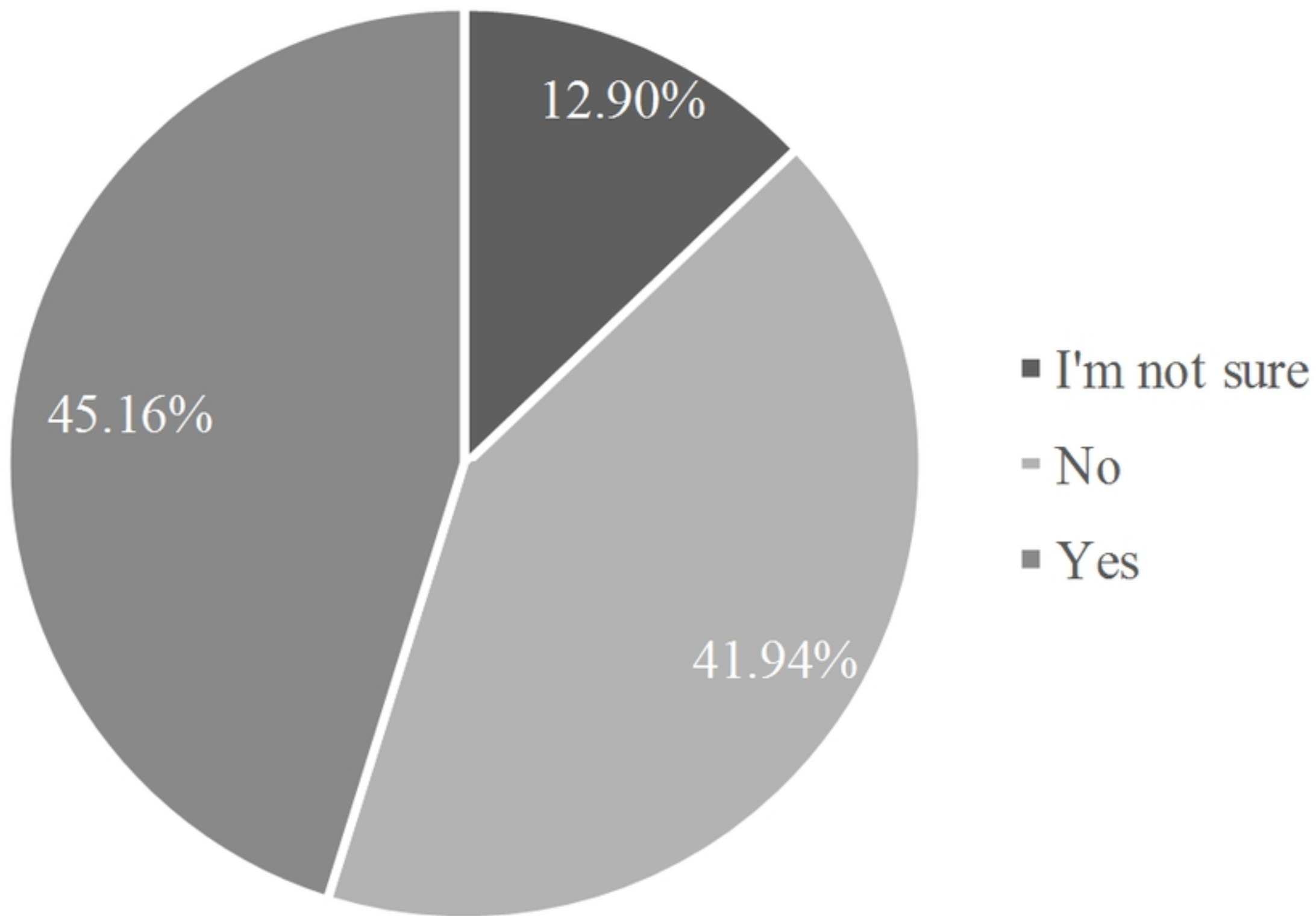


Fig 3

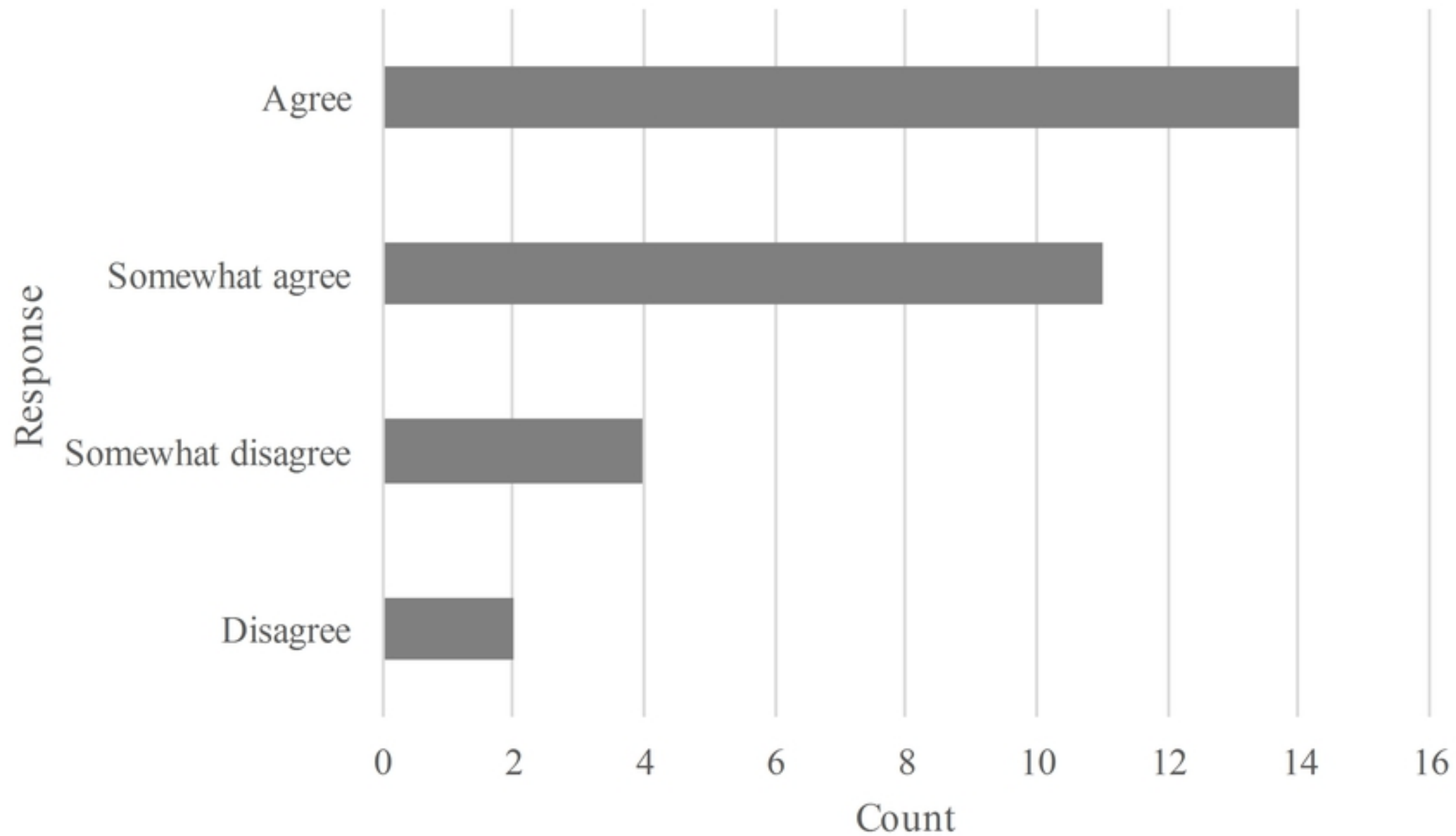


Fig 1

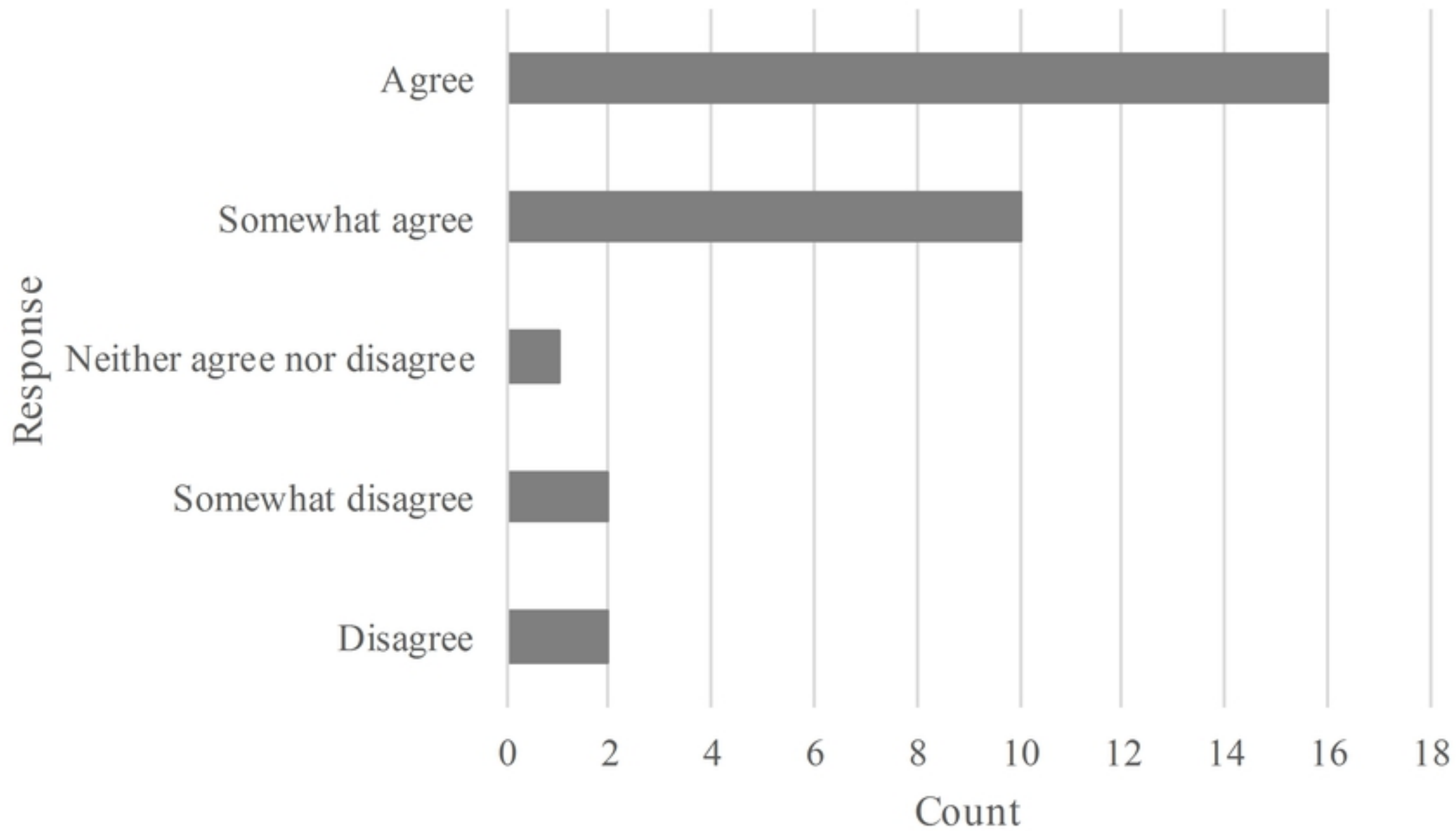


Fig 2