

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	%
<b>Country</b>		
Bolivia	4	13%
Brazil	1	3%
Ecuador	6	19%
Guatemala	10	32%
Mexico	2	7%
Nicaragua	2	7%
Panama	1	3%
Paraguay	5	16%
<b>Gender</b>		
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**

<b>Answer</b>	<b>Count of Physicians Who Chose Response</b>	<b>Percentage of Physicians Who Chose Response</b>
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

327

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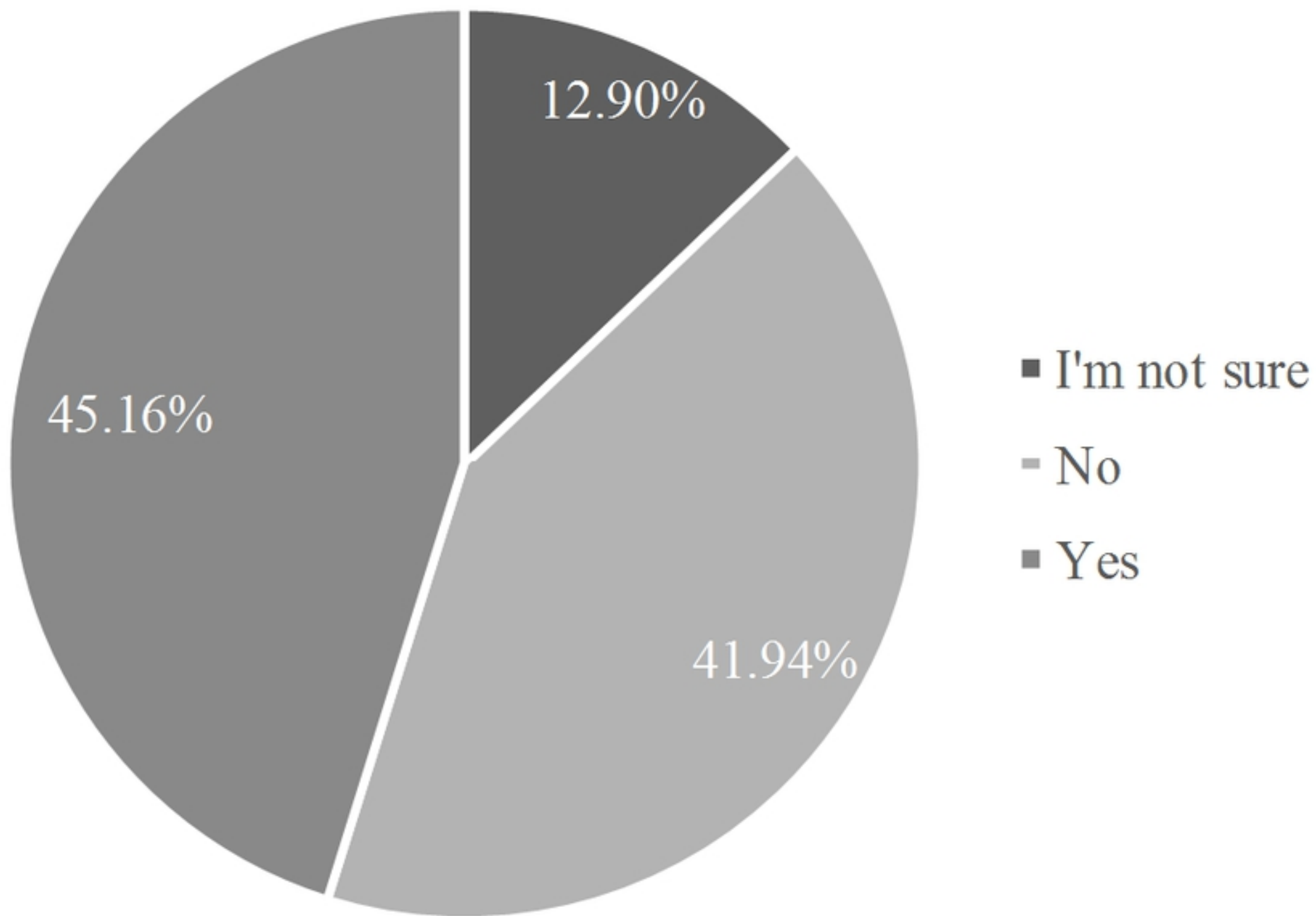


Fig 3

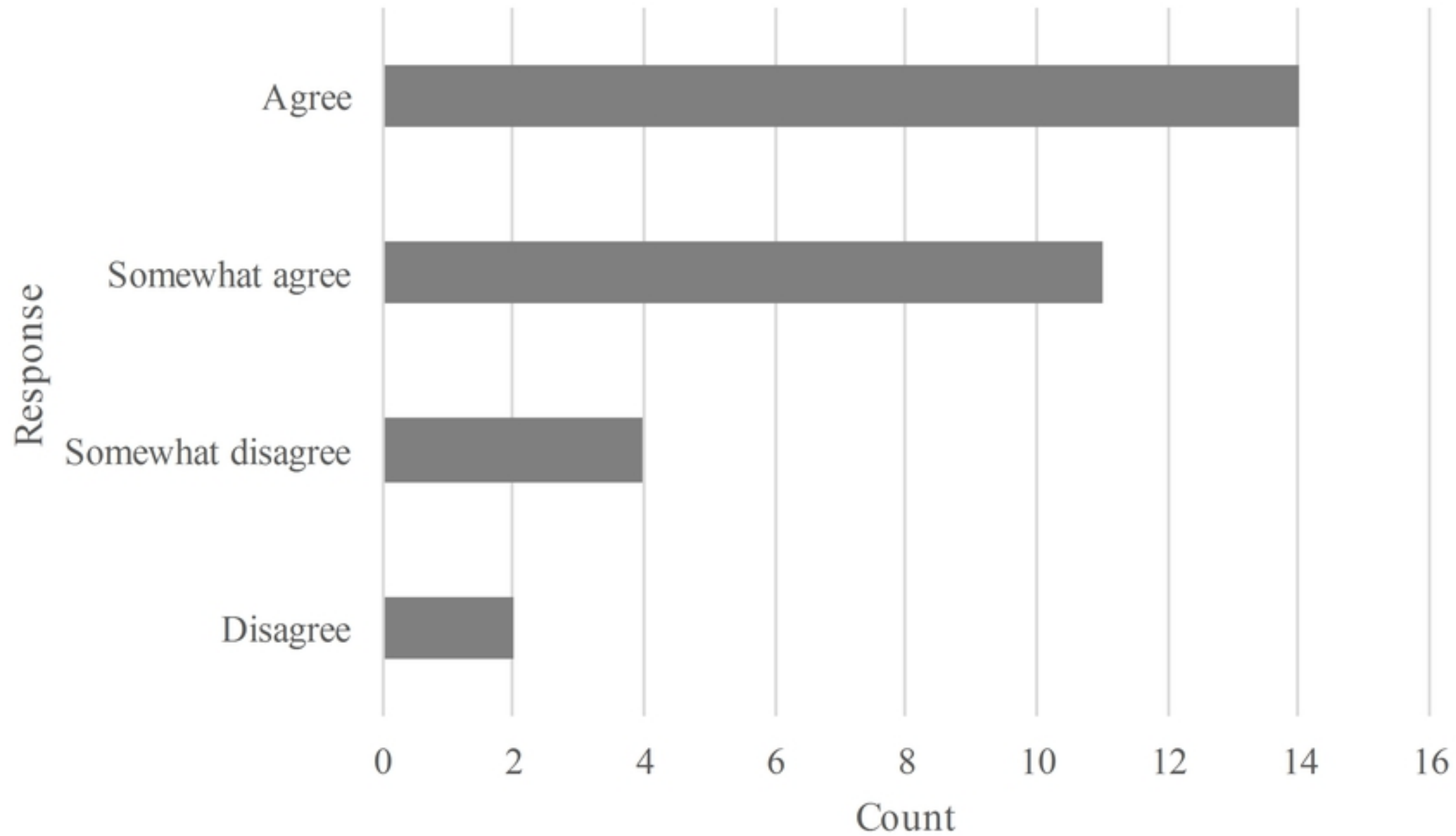


Fig 1

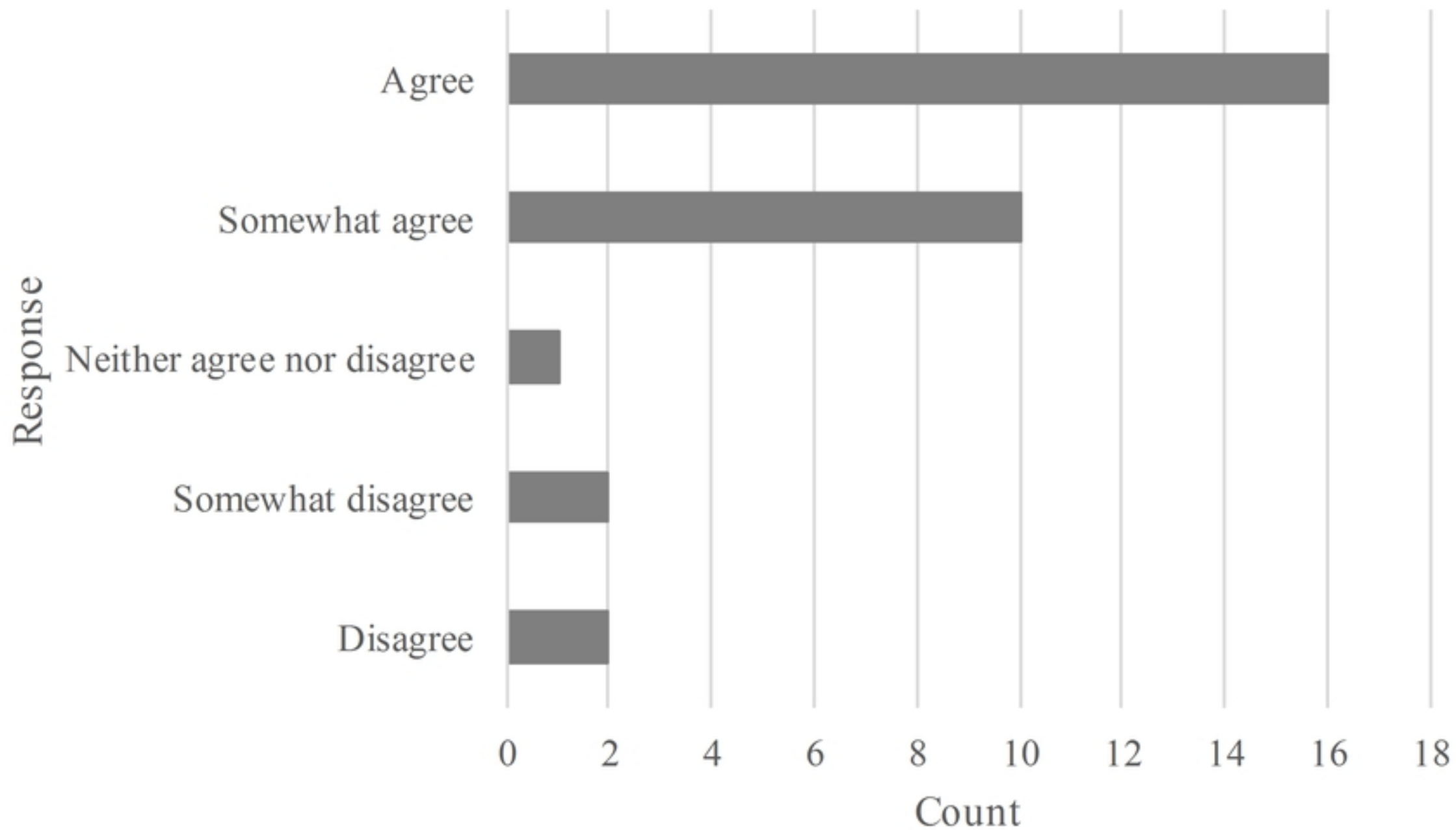


Fig 2