GPs' motivation for teaching medical students in a rural area - development of the Motivation for Medical Education Questionnaire (MoME-Q)

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Background The establishment of a medical education program in the rural area of Siegen is planned to be the first step against a shortage of physicians in this region. General Practitioners (GPs) will be extensively involved in this program as Family Medicine (Allgemeinmedizin) will become a core subject in the curriculum nationwide. Based on this situation we aim to figure out GPs motivation to participate in medical education. For this purpose, we had to construct and test a new questionnaire. Methods A survey was conducted among General Practitioners (GPs) in the region of Siegen-Wittgenstein regarding their motivation to participate in medical education. For this purpose, the Motivation for Medical Education Questionnaire (MoME-Q), a 24-item questionnaire, was developed.Structural characteristics of GPs, the Maslach Burnout Inventory (MBI) and the Work Satisfaction Questionnaire (WSQ) were used for validation purposes. Results A representative number of GPs took part in the study (53.8%). Although the majority has no connection to a university yet (86%), 83% can imagine to participate in the education of medical students. The items of the MoME-Q load on two factors (commitment and personal benefit). The confirmatory factor analysis shows a good model fit. Subscales of the MoME-Q were able to differentiate between physicians with and without authorization to train GP residents, between practices with and without a specialized practice nurse, and between physicians with and without previous experience in medical education. The MoME-Q subscale "commitment" correlated significantly with all three subscales of the MBI. Correlations were in the medium range around |.30|. Conclusion The MoME-Q seems to be an appropriate tool to assess motivation to participate in medical educationof GPs. In our

sample, a large number of GPs is motivated to participate in the education of medical students. Future studies with larger number of GPs should be carried out to validate and confirm our findings. Whether the MoME-Q is also appropriate for other specialties should also be shown in further empirical studies.

1 **GPs' motivation for teaching medical students in a rural area**

2 **- development of the Motivation for Medical Education**

3 **Questionnaire (MoME-Q)**

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22 **Short title:** GPs' motivation to teach medical students

23

Abstract

Background

The establishment of a medical education program in the rural area of Siegen is planned to be the first step against a shortage of physicians in this region. General Practitioners (GPs) will be extensively involved in this program as Family Medicine (Allgemeinmedizin) will become a core subject in the curriculum nationwide. Based on this situation we aim to figure out GPs motivation to participate in medical education. For this purpose, we had to construct and test a new questionnaire.

Methods

A survey was conducted among General Practitioners (GPs) in the region of Siegen-Wittgenstein regarding their motivation to participate in medical education. For this purpose, the Motivation for Medical Education Questionnaire (MoME-Q), a 24-item questionnaire, was developed. Structural characteristics of GPs, the Maslach Burnout Inventory (MBI) and the Work Satisfaction Questionnaire (WSQ) were used for validation purposes.

Results

A representative number of GPs took part in the study (53.8%). Although the majority has no connection to a university yet (86%), 83% can imagine to participate in the education of medical students. The items of the MoME-Q load on two factors (commitment and personal benefit). The confirmatory factor analysis shows a good model fit. Subscales of the MoME-Q were able to differentiate between physicians with and without authorization to train GP residents, between practices with and without a specialized practice nurse, and between physicians with and without previous experience in medical education. The MoME-Q subscale "commitment" correlated significantly with all three subscales of the MBI. Correlations were in the medium range around |.30|.

Conclusion

The MoME-Q seems to be an appropriate tool to assess motivation to participate in medical education of GPs. In our sample, a large number of GPs is motivated to participate in the education of medical students. Future studies with larger number of GPs should be carried out to validate and confirm our findings. Whether the MoME-Q is also appropriate for other specialties should also be shown in further empirical studies.

Introduction

60

61 In many rural regions, a shortage of physicians, especially General Practitioners (GPs)

62 is obvious and will dramatically increase in the near future (*Adarkwah* et al., 2018;

63 *Broermann* et al., 2018). A smaller number of GPs will have to take care of a larger

64 number of patients and catchment areas will increase. Furthermore, GPs in the German

65 setting will be challenged by the Masterplan 2020. With the Masterplan Medical

66 Education 2020, the importance of „General Practice" will significantly increase. General

67 Practice will become a major subject within the medical education curriculum

68 (*Bundesministerium für Gesundheit*, 2017). On the one hand, every student will have to

69 complete three months of ambulatory patient care within the sixth study year (practical

70 year), on the other hand, General Practice will become a mandatory examination

71 subject in the final oral examination (3rd part of the examination). This matter of fact is of

72 high relevance as a large number of GP practices for teaching and training will be

73 necessary in order to comply with this demand. Those two facts, the demographical

74 perspective as well as the necessity to participate in the education of medical students,

75 create a challenge that needs to be mastered.

76 The district of Siegen-Wittgenstein represents a typical and representative rural region

77 in Germany. Here, a shortage of doctors, especially General Practitioners (GPs) is

78 obvious and will dramatically increase in the near future. Some municipalities in Siegen-

79 Wittgenstein are already listed at the Ministry of Health as municipalitites, where a

80 critical shortage of GPs has already occurred (Erndtebrück, Kreuztal, Wilnsdorf or

81 Burbach) (*Ministerium für Gesundheit, Emanzipation, Pflege und Alter des Landes*

82 *Nordrhein-Westfalen*, 2016) or is most likely to occur within the near future (e.g. Bad

83 Berleburg, Bad Laasphe) (*Ministerium für Gesundheit, Emanzipation, Pflege und Alter*

84 *des Landes Nordrhein-Westfalen*, 2017). In other words, a significant number of the

85 GPs have reached retirement age and the total number is too low to provide sufficient

86 medical service for the aging population in the district.

87 Offering a medical education program in such a region could therefore be seen as a first

88 useful step to diminish the shortage of doctors, especially GPs, in the region in order to

89 preserve medical care for patients, for instance in the rural area.

90 In the near future, medical students will be educated and trained in Siegen, where a

91 new medical campus will be established in cooperation with the University of Bonn

92 Medical School. Starting with the term 2018/19 twenty-five medical students will be

93 enrolled for the Bonn/Siegen program (*Universität Siegen*). Students will start their

94 education in Bonn for three 3 years and will then continue and finish their studies in

95 Siegen (study year 4 to 6). Prior research has demonstrated a so called "Klebeeffekt"

96 for the field of medical education, which means that a lot of medical students stay in the

97 greater area where they finished their studies in order to work in hospitals and practices

98 after passing their final exams (*Buxel*, 2009; *Lenz* et al., 2010; *Töpfer, Silbermann &*

99 *Maertins*, 2011; *Jacob, Kopp & Schulz*, 2015). As up to now no medical school campus

100 is available in Siegen, only a few GPs are collaborating with other universities regarding

101 medical education and research. Hence, only a limited number of GP sees medical

102 students in their practices on a regular basis. Having motivated teachers does have an

103 impact on students' performance. Studies have shown significant effects of teachers'

104 characteristics on the achievement of students (*Wayne & Youngs*, 2003; *Zumwalt &*

105 *Craig*, 2005). For instance, motivation of teachers can enhance autonomous learning

106 motivation in their students (*Roth* et al., 2007; *Radel* et al., 2010; *Kunter M.* et al., 2013),

107 which in the end can have a positive effect on the overall academic performance

108 (*Kusurkar* et al., 2013).

109 Until now, there is no instrument available for the assessment of teaching motivation in

110 the ambulatory setting for physicians without teaching experience. Next to qualitative

111 studies (*Thomson* et al., 2014; *Ingham* et al., 2015) to assess motivation, the Physician

112 Teaching Motivation Questionnaire (PTMQ) was developed to measure motivation to

113 teach in physicians already involved in medical education (*Dybowski & Harendza*,

114 2015). It was developed and validated in physicians from internal medicine and surgery

115 and shows good statistical quality criteria.

116 Based on this situation we aim to figure out GPs motivation to participate in medical

117 education in the district of Siegen-Wittgenstein. Furthermore, we aim to look at

118 structural characteristics and the GP's motivation to participate in medical education.

119 For this purpose, a new instrument has to be developed and examined.

120 Materials & Methods

121 Design and GP recruitment

122 We conducted a study in which all General Practitioners in the district of Siegen-

123 Wittgenstein (n=158) were invited to take part. Contact details are freely available on

124 the website of the Association of Statutory Health Insurance Physicians in the region of

125 Westphalia (https://www.kvwl.de/earzt/). GPs were asked regarding their motivation to

126 participate in medical education of students as well as their work satisfaction and

127 burnout risk. In addition, they were asked in detail regarding their future prospects of

128 working as a GP. In this paper, we focus on the GPs motivation to participate in medical

129 education of students.

130 This survey (HaMEdSi: **Ha**usärzte (GPs) for **M**edical **ED**ucation in **Si**egen-Wittgenstein)

131 was performed in general practices in the area of Siegen-Wittgenstein in Germany

132 between October 2017 and January 2018. GPs were sent a written invitation with a

133 detailed study description, informed consent and the study questionnaire. After 4 weeks

134 all GPs who did not respond received a telephone reminder by a member of the study

135 team. An invitation to participate was also sent by email to all members of the local

136 doctor's association, in which most of the GPs hold a membership. Furthermore, an

137 informative meeting on the medical education perspective at the University of Siegen

138 was held to which all GPs were invited and n=45 took part. In this meeting, GPs were

139 also reminded and invited to take part in the study.

140 The study was performed in accordance with the Declaration of Helsinki and approved

141 by the research ethics committee of the University of Marburg (Az.: Studie 127/17).

142 **Development of the Motivation for Medical Education Questionnaire**

143 **(MoME-Q)**

144 As there is no appropriate tool available to assess GPs motivation to take part in

145 medical education of students, we developed a questionnaire based on the existing

146 literature (*Thomson* et al., 2014; *Ingham* et al., 2015) as already mentioned above.

147 Further items were developed and consented by expert panel meetings involving GPs

148 as well as medical specialists experienced in the training of medical students.

149 Afterwards a small pilot study (n=6) was conducted among GPs experienced in the

150   training of medical students (n=3) as well as among GPs with less experience in

151   teaching students (n=3). All participants were invited to give a detailed written feedback

152   and were also interviewed for further feedback on the questionnaire. The initial version

153   of the questionnaire was slightly adjusted after the pilot study and as a result the

154   Motivation for Medical Education Questionnaire (MoME-Q) developed. The MoME-Q is

155   a 24item questionnaire with a four-point Likert scale with verbal descriptions "agree",

156   "slightly agree", "slightly not agree", "do not agree". Based on the critical reading of the

157   literature (*Thomson* et al., 2014; *Ingham* et al., 2015) and the expert panel meetings, we

158   hypothesized that the instrument would have a four-factor structure with factors

159   "conviction", "personal benefit", "personal resources", and "time management" with

160   lower scores meaning more positive outcomes on the respective scales.

Further instruments

162   We used the German version of the Maslach Burnout Inventory (MBI) to assess

163   occupational burnout. The MBI comprises of 22 items to be scored on a 7-point-scale

164   from "0-never" to "7-every day". It consists of 3 subscales, namely "emotional

165   exhaustion" (9 items) which measures exhaustion at work, depersonalization (5 items),

166   which measures loss of empathy and emotional distance to others, and personal

167   accomplishment (8 items) which measures competence and positive attitude towards

168   work. The three-factor structure was confirmed (*Neubach & Schmidt*, 2000), Cronbach-

169   α of the emotional exhaustion scale was .85, of the personal accomplishment subscale

170   .71, and of the depersonalization subscale just .48. Other studies found higher internal

171   consistencies for this subscale with Cronbach-alphas of .69 and .86, respectively

172 (*Schwarzer, Schmitz & Tang*, 2000; *Gumz* et al., 2013). Convergent and discriminant

173 validity of the MBI could be demonstrated.

174 The Work Satisfaction Questionnaire is comprised of 17 items to be scored on a 7-

175 point-scale from "1-very dissatisfied" to "7-very satisfied". It has a five-factor structure

176 with factors patient care (4 items, Cronbach-α = .76), burden (4 items, α = .79), income-

177 prestige (3 items, α = .83), personal rewards (3 items, α = .71), professional relations (2

178 items, α = .66). Furthermore, a global item asks for the satisfaction with the current job

179 situation. This item correlates with the subscale scores form .39 - .71 (*Bovier &*

180 *Perneger*, 2003).

Statistical analyses

181 **Statistical analyses**

182 There were up to 3 missing values on single items of the MoME-Q. They were replaced

183 by the k nearest neighbor algorithm (kNN) (*Beretta & Santaniello*, 2016) using the R

184 package VIM (*Kowarik & Templ*, 2016).

185 We conducted a confirmatory factor analysis with the R package lavaan (*Rosseel*,

186 2012). We used the robust Unweighted Least Squares Estimator (ULSMV), as this

187 estimation method makes no distributional assumptions (*Rosseel*, 2012; *Lei & Wu*,

188 2015). Different model-fit statistics were calculated. The χ^2/df ratio is a badness-of-fit-

189 index as smaller values indicate a better fit (*West, Taylor & Wu*, 2015). Values around 2

190 signal a good model fit. The Root Mean Square Error of Approximation (RMSEA) is a

191 population-based index that relies on the noncentral χ^2 distribution. It can be regarded

192 as an "error of approximation" index because it assesses the extent to which a model

193 fits reasonably well in the population (*Brown*, 2015). Values $\leq$ .08 are considered to

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194   indicate an adequate model fit (*Browne & Cudeck*, 1993). The standardized root mean

195   square residual (SRMR) was calculated that measures the mean absolute value of

196   covariance residuals (*Little & Kline*, 2016). Values below .10 indicate a good model-fit

197   (*Weiber & Mühlhaus*, 2014). The Comparative Fit Index (CFI) and the Tucker Lewis

198   Index (TLI) were not considered as they are sensitive to smaller sample sizes like ours

199   in ULS estimation (*Lei & Wu*, 2015). The resulting items and scales were examined by

200   parameters based on classical test theory like Cronbach-α, discriminatory power,

201   average intercorrelations. Omega coefficients for the applied scales were also

202   computed using R packages psych and GPArotation as they have known advantages

203   over Cronbach's-α (*Raykov*, 2001).

204   We used Hotelling´s T^2 -test from the R library "Hotelling" to compare different

205   demographic groups on the scales of the MoME-Q (*Hair*, 2010). After a significant

206   multivariate result univariate Welch t-tests were calculated to explore the analyses

207   further. The univariate effect size partial Cohen´s d was then calculated with values of

208   .20 representing a small effect, .50 showing a medium effect, and .80 a large effect

209   (*Grissom & Kim*, 2012).

210   We used the Spearman correlation coefficient to calculate associations between the

211   MoME-Q subscales and other instruments as most of the variables deviated

212   significantly from the normal distribution (*Kim, Kim & Ergün*, 2015). Due to multiple

213   testing, the significance value was adjusted by the Bonferroni correction (*Bortz &*

214   *Schuster*, 2010).

215

216 **Results**

217 **Characterization of the study sample**

218 The total population consists of 158 GPs. Of them, 85 (53.8%) took part in the study

219 and completed the questionnaire. There are 64 male GPs (75.3%) in our sample. The

220 gender distribution conforms to the proportions in the population in this specific area.

221 Mean age of the participants is 53.5 years (SD 8.93) with a median of 54 years, a

222 minimum age of 32 and a maximum age of 73 years. The majority (91.8%) are practice

223 owners, work full-time (90.6%) and work in a group practice (67.1%). The average study

224 participant works in private practice for 18.41 years (mean, SD 9.8 yrs.) with a range

225 between 2 and 43 years. Most of them are specialized in General Practice (51.8%),

226 whereas 24.7% are specialized in Internal Medicine and 20.0% have both

227 specializations. The minority (3.5%) are „Praktischer Arzt" without any further

228 specialization. This denomination has been disestablished and taken out the regulation

229 for further education in 1992. It is notable that despite of all political obstacles 94%

230 would become GP again.

231 Looking at teaching, only 14% have an affiliation with a university. The majority (59%)

232 has at least some teaching experience, for instance most GPs have seen students for a

233 clinical elective (57%), whereas only 17% have seen students within a university

234 primary care rotation program (Blockpraktikum). A minority of 11% has seen students

235 for parts of the practical year and only 3% have ever given lectures or seminars at a

236 medical school.

237

238

239   Table 1 summarizes the demographic characteristics of the study participants.

240   **Please insert Table 1 about here.**

241

242   **Motivation for Medical Education Questionnaire (MoME-Q)**

243   The original version of the Motivation for Medical Education Questionnaire consisted of

244   28 items (supplementary table 1). After inspection of the statistical characteristics of the

245   items and supported by the explorative nature of the study, we decided to exclude 4 of

246   them from further analyses (table 2). Further details are explained below.

247   **Please insert Table 2 about here.**

248   The item „I hope to attract more patients being an „Academic Teaching Practice" was

249   initially considered to have a positive connation. The study results show, that GPs in the

250   region of Siegen-Wittgenstein, threatened by a critical shortage, do not desire to treat

251   more patients. Consequently, 76.5% of responses are in categories „3" and „4" which

252   means that physicians do not wish to attract more patients for their practices as their

253   current workload obviously is already high. The item is highly left skewed ($p<.001$).

254   The item „Students can support and relieve me in daily routine patient care" can be

255   interpreted differently. On the one hand, the GP as a teacher should focus on teaching

256   and support a good learning environment and not make use of the student's work force

257   in the first instance. On the other hand, integrating students in real patient care

258   according to their state of knowledge can make sense and foster personal development.

259   Furthermore, teaching students next to patient care in daily practice is also time-

260   consuming. As the content of the item remained unclear, we decided to exclude it. The

261   item „I hope that General Practice gets more attention if more GPs take part in medical

262   education of students" is too general. Therefore, 76.5% of responses are in categories

263   „1" and „2" which means that physicians hope that their specialty will get more

264   recognition by participating in the education of students.

265   The item „I have made bad experiences with medical students in my practice in the

266   past" has a mean of 3.81, a median of 4, and a SD of 0.15; 100% of responses are in

267   categories „3" and „4" which means that physicians hardly ever made bad experiences

268   with students. Most of the study participants did not make experiences with medical

269   students at all, which made it impossible for the majority of study participants to answer

270   this question.

271   Descriptive statistics of the remaining 24 items are displayed in Table 3. The numbering

272   of the items in the article corresponds to the initial version of the questionnaire. As can

273   be seen, a substantial number of items shows significant deviations from normality

274   regarding skewness and kurtosis.

275   **Please insert Table 3 about here.**

276

277   The remaining items were hypothesized to load on the 4 different factors conviction,

278   personal benefit, personal resources, and time management. The confirmatory factor

279   analysis with the robust ULSMV estimation method showed a good model fit: $\chi^2/df =$

280   1.36, RMSEA = .066, SRMR = .096. Factors conviction and personal resources

281   correlated .97 and there was also a high correlation between factors conviction and time

282   management (r = -.86). Model parsimony is a main target in confirmatory factor

283   analysis. Highly correlating factors do not convey additional information. Therefore,

284   factors conviction, personal resources, and time management were united into one

285   factor called „commitment" and a new analysis postulating a two-factor model

286   ("commitment" and "personal benefits") was performed. The confirmatory factor analysis

287   with the robust ULSMV estimation method again showed a good model fit: $\chi^2/df = 1.38$,

288   RMSEA = .067, SRMR = .098.

289   **Please insert Table 4 about here.**

290   As shown in Table 4, all factor loadings are in the satisfactory range and the correlation

291   between the two factors is also acceptable (r = .503). Therefore, this two-factor solution

292   can be accepted and we calculated 2 subtest scores in the MoME-Q for further

293   analyses. We have to mention that this is not a confirmatory but a model generating

294   approach (*Jöreskog*, 1993) which means that this structure has to be confirmed in a

295   new sample. This was done as the instrument was newly developed and there were

296   only preliminary hypotheses about the structure of the questionnaire. After reversing

297   items 18, 19, 20, 21, 22, 23, 24, 26, 27, and 28 the scale score of „commitment" was

298   calculated.

299   The mean of the scale "commitment" was 31.0 (SD 8.4) with a median of 30, a minimum

300   of 19, and a maximum of 53 (Figure 1). Its distribution deviated significantly from a

301   normal distribution: Shapiro-Wilk-Test, p<.001; Skewness, p = .003; Kurtosis, p=.35.

302   Cronbach-α coefficient was .90, omega coefficient was .91, the average inter-item-

303   correlation was .37. Discriminatory power of the items ranged from .31 - .79. All values

304   can be classified as satisfactory to high.

305   **Please insert Figure 1 about here.**

306   The mean of the scale personal benefit was 17.9 (SD 4.4) with a median of 18, a

307   minimum of 10, and a maximum of 31 (Figure 2). Its distribution mainly deviated

308   significantly from a normal distribution: Shapiro-Wilk-Test, $p = .02$; Skewness, $p = .02$;

309   Kurtosis, $p = .19$. Cronbach-α coefficient was .81, omega coefficient was also .81, the

310   average inter-item-correlation was .34. Discriminatory power of the items ranged from

311   .33 - .65. All values can be classified as satisfactory to reasonably high.

312   **Please insert Figure 2 about here.**

313   **Association with demographic characteristics**

314   We median dichotomized age of physicians and then compared the two groups on the

315   scales of the MoME-Q. The descriptive values are displayed in Table 5.

316   **Please insert Table 5 about here.**

317

318   There was no significant multivariate effect ($T^2(2,81) = 4.15$, $p = .14$). The two age

319   groups did not differ significantly on the scales of the MoME-Q.

320   We compared those physicians who had an authorization for performing practical

321   education for future GPs with those who did not have this authorization on the scales of

322   the MoME-Q. The descriptive values are displayed in Table 6.

323   **Please insert Table 6 about here.**

324

325   There was a significant multivariate effect ($T^2(2,82) = 7.32$, p = .03). Univariate analyses

326   revealed a significant difference between the two groups on the subscale personal

327   benefit t(75.6) = -2.62, p = .01. A medium effect was shown by effect size Cohen´s d

328   with .57. Those with authorization to perform practical education for future GPs hope to

329   have more personal benefits than those who do not possess this authorization. No

330   significant difference occurred on the scale commitment t(78.2) = -0.60, p = .55, d = .13.

331   We further compared those practices with a specialized practice nurse or with a practice

332   nurse still in training with those who do not have a specialized practice nurse and who

333   do not intend to have one in the future on the scales of the MoME-Q. This was done to

334   investigate if there is a trend to support education of staff members in general. The

335   descriptive values are displayed in Table 7.

336   **Please insert Table 7 about here.**

337

338   There was a significant multivariate effect ($T^2(2,81) = 7.93$, p = .02). Univariate analyses

339   revealed a significant difference between the two groups on the subscale commitment:

340   t(81.9) = 2.82, p = .006. A medium effect was shown by effect size d= .62. Those

341   physicians with a practice nurse show a higher commitment than those physicians who

342   do not have a practice nurse and who do not have the intention to have a practice nurse

343   in the future. There was no significant difference between the two groups on the scale

344   personal benefit: $t(75.8) = 0.85$, $p = .40$ with a small effect size of $d = .19$.

345   We compared those physicians with experience in medical education with those who

346   did not have experience in medical education on the scales of the MoME-Q. The

347   descriptive values are displayed in Table 8.

348   **Please insert Table 8 about here.**

349

350   There was a significant multivariate effect ($T^2(2,82) = 25.93$, $p < .0001$. Univariate

351   analyses revealed a significant difference between the two groups on the subscale

352   commitment: $t(59.2) = -4.74$, $p < .0001$. A large effect was shown by effect size $d=1.05$.

353   Those physicians with experience in medical education expressed a significantly higher

354   commitment for medical education than those physicians without experience in medical

355   education. There was also a significant difference between the two groups on the scale

356   personal benefit: $t(57.8) = -2.50$, $p = .015$ with a medium effect size of $d = .55$. Those

357   physicians with experience in medical education expect a higher personal benefit from

358   medical education than those physicians who do not have experience in medical

359   education.

360   **Associations with burnout and work satisfaction**

361   We calculated Spearman correlation coefficients between MoME-Q scales and

362   subscales of the Maslach Burnout Inventory (MBI) (Table 9).

363   **Please insert Table 9 about here.**

364

365   The MoME-Q subscale "commitment" correlated significantly with all three subscales of

366   the MBI. Correlations were in the medium range around |.30|. Those physicians with

367   higher commitment scores and therefore lower commitment to teach had higher scores

368   on emotional exhaustion and depersonalization and vice versa. Those physicians with

369   lower commitment scores and therefore higher commitment to teach had higher scores

370   on the MBI subscale personal accomplishment and vice versa. The correlations of the

371   MoME-Q subscale "personal benefits" with MBI subscales were around zero.

372   **Please insert Table 10 about here.**

373

374   None of the correlations between the MoME-Q subscales and the subscales of the

375   Work Satisfaction Questionnaire reached significance after Bonferroni correction (Table

376   10). The only tendency which can be reported is that those physicians with lower

377   commitment scores and therefore higher commitment to teach are more satisfied with

378   their current job situation and vice versa. A German version of the MoME-Q can be

379   found in the supplement (supplementary table 2).

380

381

382 Discussion

383 We present a 24-item questionnaire to assess motivation in non-experienced GPs to

384 participate in the education of medical students. After taking a model generating

385 approach in confirmatory factor analysis, the MoME-Q could be best characterized by a

386 two-factor model instead of the initial hypothesis of a four-factor structure. Factor

387 "commitment" consisted of 16 items with Cronbach-α and omega-coefficients around

388 .90 while factor "personal benefit" had 8 items with Cronbach-α and omega-coefficients

389 being around .80.

390 Mean differences between most groups based on demographic characteristics

391 demonstrate the validity of the MoME-Q to highlight relevant aspects for the motivation

392 in medical education. Median dichotomized age groups did not differ significantly in their

393 scores on the MoME-Q subscales. Physicians with authorization to train GP residents

394 expect to have more personal benefits than those who do not possess this authorization

395 (medium effect size). Physicians with a practice nurse show a higher commitment to

396 teach than those physicians who do not have a practice nurse and who do not have the

397 intention to have a practice nurse in the future (medium effect size). The latter two

398 findings show that GPs who set value on further education of their employees also tend

399 to teach medical students. Physicians with experience in medical education expressed

400 a significantly higher commitment for medical education and expect higher personal

401 benefit than those physicians without experience in medical education (large and

402 medium effect sizes, respectively). This finding is quite promising as it shows that GP

403 teachers see the benefit from their efforts and are apt to continue medical education of

404 students. Correlations with the Maslach Burnout Inventory revealed that physicians with

405 higher commitment scores and therefore lower commitment to teach had higher scores

406 on emotional exhaustion and depersonalization and vice versa, which is not surprising.

407 Physicians with lower commitment scores and therefore higher commitment to teach

408 had higher scores on the MBI subscale personal accomplishment and vice versa. Work

409 satisfaction surprisingly was not significantly associated with motivation to teach. The

410 only tendency which can be reported is that those physicians with lower commitment

411 scores and therefore higher commitment to teach are more satisfied with their current

412 job situation and vice versa.

413

414 The results of our study are promising regarding the project to establish a medical

415 campus in Siegen. Much more GPs than expected are willing to participate in the

416 medical education process of students, especially compared to the current situation. A

417 total of 83% of the GPs can imagine to participate in medical education. Hence, the

418 willingness to have students in the practice for short terms (i.e. two-week rotations) is

419 higher than for long-term education (i.e. practical year). Teaching students out of the

420 own practice is not wanted by the majority of GPs as this would mean an additional

421 expenditure of time. Nevertheless, these results need to be interpreted with caution.

422 Being motivated according to the questionnaire needs to be turned into action, i.e.

423 participation in training programs and educating students in reality. Furthermore, the

424 results also show that the willing population of GPs needs preparation and support, e.g.

425 by didactical courses and training programs. In addition, delegation plays a growing role

426 in patient care, especially in rural areas. Courses for non-medical staff (doctor's

427 assistants) are available to become practice nurses that take on more responsibility in

428   patient care. This is becoming more relevant and important as due to a shortage of GPs

429   delegation gets more important. Although investigating a rural area, less than half of the

430   GPs do have practice nurses and what even surprises more is that only 11% of the GPs

431   do have staff members in training to become practice nurses. The reasons for that

432   remain unclear. We can only speculate that the absence of a course offer might lead to

433   this low rate of staff members in training. Currently, courses are only available in a

434   distance of about 100km.

435   Looking at research, the majority can imagine participate in specific research projects.

436   They are basically also willing to recruit patients in the practice, which must be seen as

437   the basis for primary care research.

438   A strength of our study was that we were able to conduct a full population survey in a

439   limited geographic area. The response rate of 53.8 % can be regarded as satisfactory

440   as the survey contained several self-relevant questions regarding own future work

441   prospects and continuity of practices. These are topics, which might cause

442   psychological irritation and might therefore be avoided. This might in turn result in a

443   rejection to participate in a survey containing questions having a possible negative

444   influence on self-esteem (*Harmon-Jones & Harmon-Jones*, 2007). Of course, our study

445   is subject to some limitations. First, the sample size for confirmatory factor analysis was

446   smaller than the proposed n=200 in the literature (*Brown*, 2015) although the resulting

447   solutions had satisfactory quality criteria. Our results regarding the development of the

448   MoME-Q should be replicated with independent and larger samples as we applied a

449   model generating approach in confirmatory factor analysis. This means that the

450   proposed two factorial solution has to be confirmed with different samples in order to be

451   called a stable solution (*Jöreskog*, 1993). Second, GPs were investigated and our

452   conclusions should therefore be restricted to this specific group.

453   As already mentioned above, there is no appropriate tool available to assess the

454   motivation of General Practitioners to teach medical students for the purpose of our

455   study. The study by Thomson et al., where we derived some items from, is a qualitative

456   study. The study group undertook semi-structured interviews with GPs, who do already

457   have teaching experiences (*Thomson* et al., 2014). In the study of Ingham et al.,

458   Australian GPs who are already functioning as GP supervisors were investigated by

459   means of semi-structured interviews (*Ingham* et al., 2015). The article of Dybowski et al.

460   presents the validation of the Physician Teaching Motivation Questionnaire (PTMQ).

461   This questionnaire is more appropriate to assess motivation of physicians who are

462   already involved in teaching, which makes an important difference as we focus on

463   physicians with no or almost no teaching experience. The validation was further done at

464   a study group of hospital-based-physicians who work at university hospitals (*Dybowski*

465   *& Harendza*, 2015), whereas we look at GPs who work in their private practices and

466   who mostly had no prior experiences in teaching medical students.

Conclusion

468   We for the first time present an instrument to assess motivation of GPs with less or no

469   teaching experience to take part in the medical education of students. We could

470   demonstrate that the MoME-Q is an appropriate tool to measure motivation for teaching

471   participation of GPs. Motivation is a complex construct, which is subject to many

472   different influencing factors such as work satisfaction and prior experiences. Future

473   studies with larger number of GPs should be carried out to validate and confirm our

474   findings. Whether the MoME-Q is also appropriate for other specialties should also be

475   shown in further empirical studies.

476   The results of our study are also promising regarding the project to establish a medical

477   campus in a rural region. The problem to get a sufficient number of GPs involved in

478   teaching purposes to face the challenge of the masterplan 2020 seems solvable.

479   Nevertheless, the results also show that the willing population of GPs needs preparation

480   and support, e.g. by didactical courses and training programs.

481   **List of abbreviations**

482   CFI   Comparative Fit Index

483   GP   General Practitioner

484   HaMEdSi   Hausärzte (GPs) for Medical EDucation in Siegen-Wittgenstein

485   kNN   k nearest neighbor algorithm

486   MBI   Maslach Burnout Inventory

487   MoME-Q   Motivation of Medical Education questionnaire

488   PTMQ   Physician Teaching Motivation Questionnaire

489   SD   standard deviation

490   SRMR   standardized root mean square residual

491   TLI   Tucker Lewis Index

492   ULSMV   Unweighted Least Squares Estimator

493   **Acknowledgements**

494   We thank all GPs who participated in this study without receiving financial

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496

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607

Table 1(on next page)

Demographic characteristics of study participants (n=85)

1   **Table 1.** Demographic characteristics of study participants (n=85)

General characteristics	
Age	Mean 53.5 years SD 8.9
Years in practice	Mean 18.4 years SD 9.8
Gender	64 male (75%) 21 female (25%)
Practice ownership	78 practice owners (92%) 7 practice employees (8%)
Specialization	44 General Practice (52%) 21 Internal Medicine (25%) 17 General Practice and Internal Medicine (20%) 3 none (3%)
Practice form	28 single practice (33%) 57 group practice (67%)
Modus of work	78 full-time (92%) 7 part-time (8%)
Would become GP again	80 (94%)

Teaching experience	
Cooperation with medical school / status of an adacemic teaching practice	12 (14%)
Any preexisting teaching experience	50 (59%)
One-day observation	38 (45%)
Two-week rotation	14 (17%)
clinical elective	48 (57%)
Practical Year	9 (11%)
Lectures at a university	3 (3%)
Visited didactics training within last 2 years	5 (6%)

Perspectives on participation in education of medical students	
Would become active in the training of medical students in Siegen	71 (83%)

One-day observation	68 (80%)
Two-week rotation	63 (74%)
clinical elective	58 (68%)
Practical Year	49 (58%)
Lectures at a university	29 (34%)
Participation in research projects	58 (68%)
Recruitment of patients in practice	48 (57%)
Qualification of non-medical staff	
Practice nurse	33 (39%)
Number of practice nurses	1: 65 (77%) 2: 14 (16%) 4: 6 (7%)
Staff member currently doing the practice nurse curriculum	9 (11%)
Number of staff members currently doing the practice nurse curriculum	1: 48 (56%) 2: 37 (44%)
Staff member planning to do the curriculum	30 (35%)

2   GP = General Practitioner

3

4

Table 2(on next page)

Final version of the MoME-Questionnaire (24 items)

1   **Table 2.** Final version of the MoME-Questionnaire (24 items)

2

3

		agree	slightly agree	slightly not agree	not agree
1	I want to contribute in promoting and educating medical students.	1	2	3	4
2	It is my social responsibility to actively participate in the education of medical students.	1	2	3	4
3	I have a mind to educate students and to share my knowledge.	1	2	3	4
4	Educating students is a knowledge exchange where both sides may benefit from.	1	2	3	4
5	Being an „Academic Teaching Practice" (related to a university) enhances the status of my practice.	1	2	3	4
6	Patients feel that I am more qualified if future medical doctors are trained in my practice.	1	2	3	4
7	Being an „Academic Teaching Practice" (related to a university) is publicity for my practice.	1	2	3	4
8	I hope that cooperating with a university facilitates access to evidence based information.	1	2	3	4
9	Cooperating with the university is a good chance to get touch with colleagues and build a network.	1	2	3	4
10	Cooperating with the university increases my chances to find a successor form y own practice.	1	2	3	4
11	Students can spend more time with patients what increases patients'	1	2	3	4

		agree	slightly agree	slightly not agree	not agree
	satisfaction.				
12	Teaching students also means to be up-to-date with respect to medical information.	1	2	3	4
13	<u>Positive experiences</u> I made during my own training period motivate me to participate in the education of medical students.	1	2	3	4
14	<u>Negative experiences</u> I made during my own training period motivate me to participate in the education of medical students.	1	2	3	4
15	I believe I am too old to teach medical students.	1	2	3	4
16	I do not have sufficient didactical compretencies.	1	2	3	4
17	Students derange practice administration.	1	2	3	4
18	I can treat less patients if I instruct students in my practice.	1	2	3	4
19	Being exposed to students frequently my patients are less satisfied.	1	2	3	4
20	I operate at full capacity regarding patient treatment. This is why I do not have time to teach and train students **in my practice.**	1	2	3	4
21	I operate at full capacity regarding patient treatment. This is why I do not have time to teach and train students **out of my practice.**	1	2	3	4
22	I am not interested in teaching medical students (lectures at the university).	1	2	3	4
23	I am not interested in instructing medical students in my practice.	1	2	3	4
24	Family commitments debar me from participating in teaching students.	1	2	3	4

4

5   items belonging to factor „commitment"
6   items belonging to factor "personal benefit"
7

Table 3(on next page)

Descriptive statistics of the remaining 24 items of the MoME-Q.

1   **Table 3.** Descriptive statistics of the remaining 24 items of the MoME-Q.

2

	Mean	SD	Median	Skewness	Kurtosis
Item 1	1.46	.73	1	1.63 (p<.001)	2.28 (p<.001)
Item 2	1.88	.75	2	0.52 (p=.03)	-0.08 (p=.44)
Item 3	1.61	.71	1	0.93 (p<.001)	0.39 (p=.23)
Item 4	1.46	.65	1	1.10 (p<.001)	0.11 (p=.42)
Item 5	2.12	.84	2	0.36 (p=.09)	-0.42 (p=.22)
Item 6	2.42	.86	2	0.07 (p=.39)	-0.61 (p=.13)
Item 7	2.44	.91	2	0.00 (p=.50)	-0.76 (p=.08)
Item 9	2.55	.82	3	0.05 (p=.43)	-0.51 (p=.17)
Item 10	2.06	.86	2	0.45 (p=.04)	-0.45 (p=.20)
Item 11	2.01	.88	2	0.66 (p=.007)	-0.12 (p=.42)
Item 13	2.39	.77	2	0.31 (p=.12)	-0.18 (p=.37)
Item 14	1.85	.75	2	0.77 (p=.002)	0.80 (p=.07)
Item 16	2.13	1.02	2	0.35 (p=.09)	-1.08 (p=.02)
Item 17	2.62	1.01	3	-0.17 (p=.26)	-1.04 (p=.03)
Item 18	3.58	.73	4	-1.97 (p<.001)	3.87 (p<.001)
Item 19	3.19	.84	3	-0.74 (p=.003)	-0.20 (p=.36)
Item 20	2.85	.85	3	-0.29 (p=.14)	-0.56 (p=.15)
Item 21	2.32	.69	2	0.14 (p=.30)	-0.08 (p=.44)
Item 22	2.96	.68	3	-0.42 (p=.06)	0.54 (p=.16)
Item 23	2.85	.87	3	-0.37 (p=.08)	-0.47 (p=.19)
Item 24	2.34	1.13	2	0.25 (p=.17)	-1.32 (p=.007)
Item 26	3.44	.88	4	-1.31 (p<.001)	0.46 (p=.19)
Item 27	3.58	.75	4	-1.77 (p<.001)	2.47 (p<.001)
Item 28	3.09	1.03	3	-0.79 (p=.001)	-0.62 (p=.12)

3

4

Table 4(on next page)

Factor loadings of the two-factor solution in the confirmatory factor analysis.

1 **Table 4.** Factor loadings of the two-factor solution in the confirmatory factor analysis.

	factor loading
Factor commitment	
Item 1	.78
Item 2	.64
Item 3	.85
Item 4	.67
Item 16	.54
Item 17	.39
Item 18	-.54
Item 19	-.56
Item 20	-.57
Item 21	-.36
Item 22	-.48
Item 23	-.84
Item 24	-.53
Item 26	-.64
Item 27	-.81

Item 28	-.53
Factor personal benefit	
Item 5	.58
Item 6	.66
Item 7	.53
Item 9	.51
Item 10	.80
Item 11	.46
Item 13	.43
Item 14	.70

2

3

Table 5(on next page)

Descriptive values of the MoME-Q scales split by age groups.

1 **Table 5.** Descriptive values of the MoME-Q scales split by age groups.

	commitment mean (sd)	personal benefit mean (sd)
age < median (n=42)	29.8 (7.4)	16.9 (4.3)
age ≥ median (n=42)	31.8 (9.1)	18.8 (4.4)

2
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Table 6(on next page)

Descriptive values of the MoME-Q scales split by authorization for performing practical education for GPs.

1 **Table 6.** Descriptive values of the MoME-Q scales split by authorization for performing

2 practical education for GPs.

	commitment mean (sd)	personal benefit mean (sd)
authorization (n=45)	30.5 (7.9)	16.7** (3.8)
no authorization (n=40)	31.6 (9.0)	19.1** (4.7)

3 ** p=.01

4

Table 7(on next page)

Descriptive values of the MoME-Q scales split by practices with and without a specialized practice nurse.

1 **Table 7.** Descriptive values of the MoME-Q scales split by practices with and without a

2 specialized practice nurse.

	commitment mean (sd)	personal benefit mean (sd)
no practice nurse (n=45)	33.4* (8.5)	18.3 (4.1)
practice nurse (n=39)	28.4* (7.6)	17.4 (4.8)

3 * p=.02

4

Table 8(on next page)

Descriptive values of the MoME-Q scales split by physicians with and without experience in medical education.

1 **Table 8**. Descriptive values of the MoME-Q scales split by physicians with and without

2 experience in medical education.

	commitment mean (sd)	personal benefit mean (sd)
experience (n=50)	27.6*** (6.4)	16.8 (3.6)
no experience (n=35)	35.8*** (8.7)	19.3 (5.0)

3 ***p<.0001
4

Table 9(on next page)

Spearman correlations of the MoME-Q scales with subscales of the Maslach Burnout Inventory (MBI). Due to multiple testing the significance level had to be adjusted to p=.05/6=.008.

1 **Table 9.** Spearman correlations of the MoME-Q scales with subscales of the Maslach

2 Burnout Inventory (MBI). Due to multiple testing the significance level had to be

3 adjusted to p=.05/6=.008.

MBI MoME-Q	emotional exhaustion	depersonalization	personal accomplishment
commitment	.30	.33	-.35
	p=.006	p=.001	p=.002
personal benefit	.08	.03	-.08
	p=.44	p=.75	p=.46

4
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Table 10(on next page)

Spearman correlations of the MoME-Q scales with subscales of the Work Satisfaction Questionnaire. Due to multiple testing the significance level had to be adjusted to p=.05/12=.004.

1 **Table 10.** Spearman correlations of the MoME-Q scales with subscales of the Work

2 Satisfaction Questionnaire. Due to multiple testing the significance level had to be
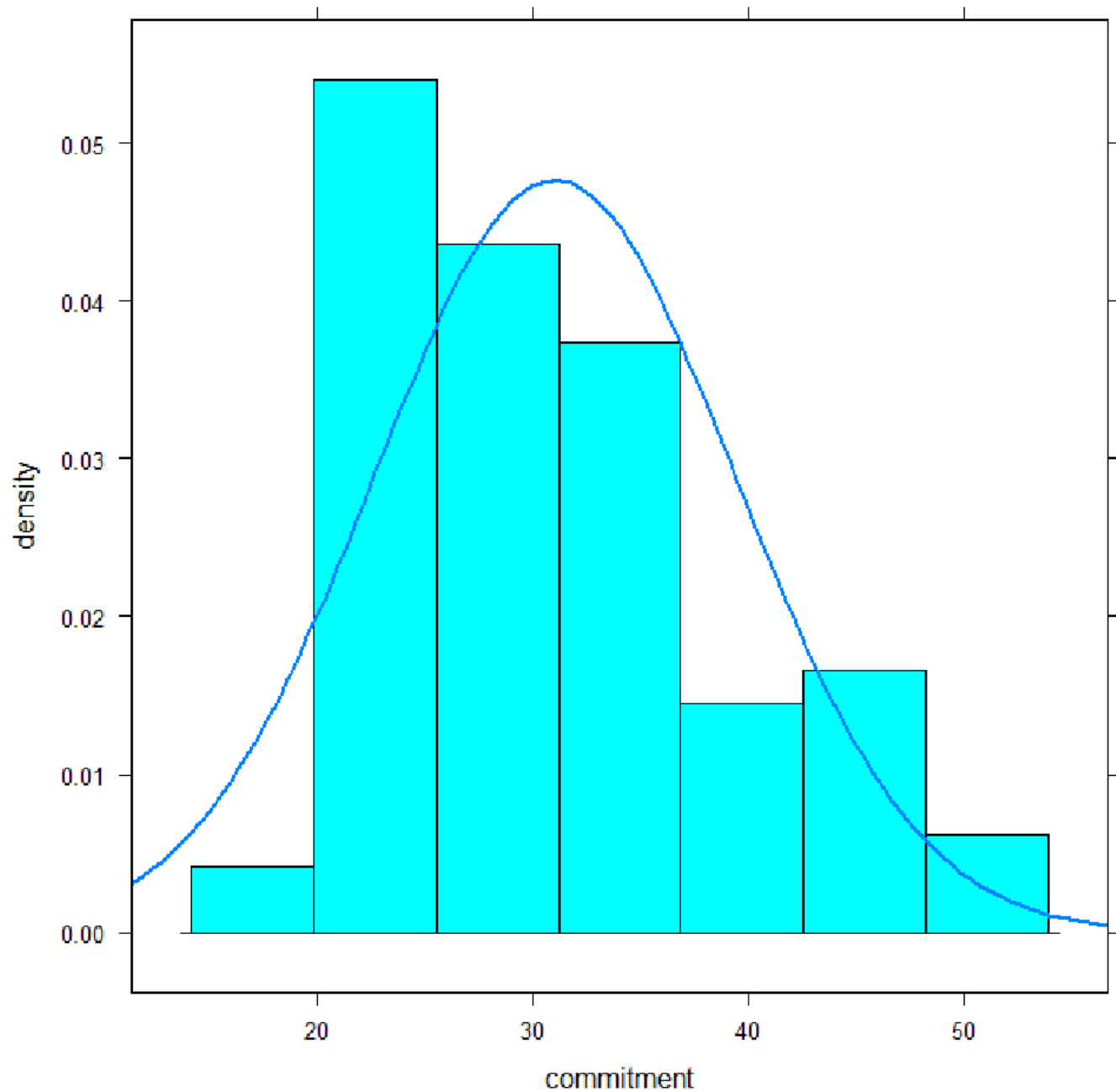
3 adjusted to p=.05/12=.004.

MoME-Q	patient care	burden	income-prestige	personal rewards	professional relations	global item
commitment	-.19	.01	.01	-.15	-.10	-.25
	p=.08	p=.95	p=.93	p=.17	p=.37	p=.02
personal benefit	-.03	.09	.07	-.09	.02	-.03
	p=.76	p=.44	p=.53	p=.42	p=.83	p=.76

4
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Figure 1

Distribution of the commitment subscale scores of MoME-Q.

Figure 2

Distribution of the personal benefit subscale scores of MoME-Q.