Factors Associated with Pharmacy Students' Attitudes towards Learning Communication Skills

- a Study among Nordic Pharmacy Students

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Abstract

Introduction: Good communication skills are essential for pharmacy students to help patients with their medicines. Students' attitudes towards communication skills learning will influence their willingness to engage in communication training, and their skills when dealing with patients later on in their professional life.

Objective: The aim of this study was to explore Nordic pharmacy students' attitudes to communication skills learning, and the associations between those attitudes and various student characteristics.

Method and Materials: A cross-sectional questionnaire-based study was conducted in 11 Nordic pharmacy schools between April 2015 and January 2016. The overall response rate for the final study population was 77% (367 out of 479 students). Pharmacy students who had fulfilled all mandatory communication training and most of their pharmacy practical experience periods were included. The communication skills attitudes scale was the main outcome. Linear regression models were fitted with the outcome variable and various student characteristics as the predictors, using generalized estimating equations to account for clustering within pharmacy schools.

Results: Nordic pharmacy students in general have moderately positive attitudes towards learning communication skills. Positive attitudes towards learning communication skills among pharmacy students were associated with being female ($\beta_{adjusted}$ 0.42, 95% CI 0.20 to 0.63, p<0.001), following a newer pharmacy training program ($\beta_{adjusted}$ 0.81, 95% CI 0.63 to 0.98, p<0.001), having higher self-rated need for communication skills improvement ($\beta_{adjusted}$ 0.50, 95% CI 0.30 to 0.71, p<0.001) and believing one's communication skills are not the result of personality ($\beta_{adjusted}$ -0.24, 95% CI -0.44 to -0.04, p=0.017).

Conclusion: The study provides important information for faculty members responsible for curriculum improvements and teachers to refine their teaching of communication skills. From this, the teaching can be better tailored to suit different students. The students' chances of being able to effectively help patients in the future will be increased by that.

Keywords: Pharmacy students; communication skills training; CSAS; Nordic countries

Highlights:

- Nordic pharmacy students in general have moderately positive attitudes towards learning communication skills.
- Positive attitudes towards learning communication skills were associated with: being female, following a newer pharmacy training program, a higher self-rated need for communication skills improvement, and believing one's communication skills are not the result of one's personality, implying that they need to be learned.
- The study provides important information for faculty members responsible for curriculum improvements and for teachers to refine their teaching of communication skills.
- Using these results, the teaching can be better tailored to suit different students, and thereby increasing the likelihood of students being able to effectively help patients in their future professional life.

Introduction

Acquiring good communication skills is essential for pharmacy students in order to act effectively when helping patients use medicines properly. Communication skills training formed part of pharmacy education as early as the 1970s and it is now included to varying degrees in pharmacy education around the world.[1,2] Central organizations such as the World Health Organization, the International Pharmaceutical Federation, the American Accreditation Council for Pharmacy Education and the European Union acknowledge patient communication training as an important part of the pharmacy curriculum.[3-5]

Attitudes interact with people's actual behavior;[6,7] hence attitudes towards communication skills training may be associated with future counseling performance.[8,9] By intervening in physicians' psycho-social attitudes, researchers have been able to show how they refined physicians' communication styles.[10] Exploring students' attitudes towards communication skills learning is important for faculty members responsible for curriculum improvements in order to understand factors impacting attitudes, comprehend students' receptiveness towards such training, and understand how different teaching activities influence attitudes.

It has been claimed that teaching and learning communication skills may be considered "soft skills" and that they encounter resistance among students in natural sciences, such as medicine or pharmacy.[11,12] Pharmacy teachers in the US reported having experienced negative attitudes towards communication training and learning among their students, and that students were more concerned about their grades and not about learning communication for their professional careers.[13]

In 2002, Rees et al. constructed a scale for exploring medical undergraduate students' attitudes towards communication skills learning; the communication skills attitude scale (CSAS).[14] This scale has been validated and used in several settings, for example among medical students in the UK, Portugal, Norway, Nepal, Germany, Finland and Korea,[15-21] but also among dental, dietetic, teaching and nursing students.[22-27] In general, medical and dental students had a moderate to positive view towards learning communication skills.[15,17-20,22-24,28-33] Gender, curriculum design and type of communication skills training, age, patient care work outside studies, year of study,

parents' first language (ethnicity), parent's occupational status, self-rated need of improvement of communication skills, and additional communication training are factors that have been shown to be related to medical, dental, dietetic, nursing or teacher students' attitudes towards communication skills learning.[15,17-20,22-25,27,30-33] The literature on pharmacy students' attitudes towards communication skills learning, based on the CSAS, is scarce and not very detailed.[34,35] An Australian study used some items from the CSAS in connection with patient communication skills training and found that the training improved students' attitudes for several of the items, including how important the students thought the topic was.[35] This study is the first study to explore Nordic pharmacy students' attitudes to communication skills learning, and also the associations between these attitudes and various student characteristics.

Method and Materials

Study design

A cross-sectional questionnaire-based study was conducted. The questionnaire, including information on the study, was handed out directly to the students as they attended lectures, or was sent to students as an identical online questionnaire.[36] No ethical approval was needed according to any of the Nordic regulations, nevertheless, participation was voluntary and anonymous. The study was registered at the Norwegian Centre for Research Data, and the information was stored confidentially.

Setting

In the Nordic countries 11 pharmacy schools (universities) educate pharmacists (of 5 years' duration); in Denmark 2 schools (University of Copenhagen; University of Southern Denmark), in Finland 2 schools (University of Eastern Finland; University of Helsinki), on Iceland 1 school (University of Iceland), in Norway 3 schools (University of Bergen; University of Oslo; University of Tromsø), and in Sweden 3 schools (Umeå University; University of Gothenburg; Uppsala University).

Sample

All 11 Nordic pharmacy schools were invited to participate. The study was carried out between April 2015 and January 2016. The inclusion criteria were that students should have fulfilled most

(>60%) of their pharmacy practical experience period (PPE) (i.e. mandatory pharmacy internship) as it was identified as an important part of the communication training. They should also have fulfilled all mandatory communication training and studying required for the master of pharmacy degree (of 5 years' duration). Due to the low response rate from the 2 universities in Finland, they were excluded from all analyses. The overall response rate for the countries remaining was 77%, with 370 out of 479 students participating (see Table 1 for details). To avoid distortions due to listwise deletion, mean scores were calculated accepting up to 20 percent missing items on CSAS, resulting in 3 cases being excluded from all following analyses (final study population=367).[37]

Questionnaire design

The questionnaire included 3 main parts; part 1 comprised the CSAS, part 2 explored students' overall perceptions of their patient communication training (reported elsewhere), and part 3 student characteristics. The questionnaire was in English, aiming at avoiding the possibility of errors arising from subtle differences that might otherwise enter into translations into 5 different languages.[38] For the purpose of this study, wordings such as 'medical students,' etc., were changed to 'pharmacy students'.

Questionnaire validation

Face validity was established by experts (persons involved in patient communication training at pharmacy and medical schools). In a pilot study, the questionnaire was tested on 21 persons (16 recently graduated pharmacists and 5 pharmacy students) representing Denmark, Iceland, Norway and Sweden. The questionnaire was evaluated for time, layout and understandability.[39] In addition, 2 pilot studies were done as 'think aloud' interviews, with 2 participants.[39] Minor modifications were made after the pilot studies.

Communication skills attitudes scale

The CSAS was used to measure students' attitudes to communication skills learning.[14] Permission was granted by Rees to use the CSAS (personal communication, December 2014). This scale has been validated in several countries[15-21] and student groups.[15-27] The original CSAS contains 26 statements.[14] Thirteen statements are negatively worded and 13 positively worded. In

the questionnaire, negative and positive statements are presented in a random order. Responses are recorded on a 5-point rating scale (1=strongly disagree, 3=neutral to 5= strongly agree).

Originally, the CSAS scale included a 2-component solution summing up either negative or positive attitudes, which were used as 2 separate outcomes in their analysis.[14,15] Studies using the CSAS scale have identified various sub-solutions.[19] This might be due to differences in the underlying sample, including sample size, culture or inclusion of different professions (e.g. pharmacists v. dentists). Therefore an explorative factor analysis using principal component analysis (PCA) was conducted for the current study sample to explore the scale construct (see Appendix 1); aiming at identifying the most statistically and theoretically sound scale for further analysis.[40] The internal consistency of the final scale was explored by calculating Cronbach's alpha. Before conducting the PCA and all other analyses, the 13 negative items were reversed.

The PCA identified 6 components with an eigenvalue > 1, see Appendix 1. Component 2 was excluded as it evaluates the outcome of the teaching rather than measure attitudes towards communication skills training. As component 3 and 4 did not fit theoretically, they were excluded. In this study a 1-component solution was seen as sufficient to capture a trend of students' general attitudes, rather than dividing them into positive and negative or other more sophisticated sub-solutions.[14,19] Therefore, component 1, 5 and 6, which measures attitudes, were combined into the final 1 component (α=0.852), including 17 out of the 26 items, and used as the outcome (ACSAS) in main analysis, see Appendix 1. A respondent's average (1 to 5) attitudinal score (ACSAS) was calculated. A higher mean score indicates stronger positive attitudes towards learning communication skills. The ACSAS scores were converted to standardized z-scores, where the respondent's z-score is the number of standard deviations (SD) from the population mean (the reference value for the mean was zero) to ease the interpretation of the results.[41] The beta values can, when using z-scores, be interpreted as increase or decrease in standard deviations, without knowing anything about the underlying scale.[41]

Main predictors
-student characteristics

Factors earlier shown to influence attitudes towards communication training were included as main predictors.[15,17,18,20,22-25,27,30-33]These were: age, gender, parents' first language (ethnicity), parents working in the health care sector (parents' occupational status), pharmacy school (university in the Nordic context) (curriculum designs/courses), participation in extra communication courses, patient care experience during studies (health care work experience). In addition, PPE placement (community or hospital pharmacy) and preferred future workplace(s) were included as they were perceived as to potentially influence attitudes. One factor, years of study, earlier shown to influence these attitudes were excluded, since most students in the Nordic countries first receive communication training at the end of their education.

Answers were collected by multiple-choice questions (for categories, see Table 2) or open-ended questions (age; parent's language). Further information about self-assessed need for improving communication skills and attitudes of the role of personality in learning communication skills were collected on a 5-point rating scale (1=strongly agree to 5=strongly disagree) and self-rated level of communication skills on a 5-point rating scale (1= very poor to 5=excellent). Assessments of personality and communication skills (I believe my communication skills are a result of my personality) were dichotomized into 2 groups; 1) strongly agree; 2) strongly disagree/disagree/neutral/agree/) to filter out those with strongest opinions. The 9 pharmacy schools were dichotomized into; 1) placement of patient communication training in the PPE only or 2) placement of patient communication training in the PPE and in additional courses and into 1) newer- and 2) the oldest pharmacy training program within each country. Further categorization of student characteristics was done as shown in Table 3. All categorical student characteristics were included as dummy variables in the regression analysis. Cross-tabulation was performed between all student characteristics to check for empty cells or overlapping categories.

Data analysis

Statistical analyses were performed using Statistical Package for the Social Sciences (SPSS) software package (SPSS 22.0 for Windows, SPSS Inc., Chicago, IL, USA). Data entry was done by 2 persons separately and then checked for accuracy; if a discrepancy arose, the original questionnaire was consulted. Descriptive statistics and ANOVAs were calculated for all variables. Data distribution was analyzed by histograms and Kolmogorov–Smirnov testing.

Linear regression models were fitted with ACSAS (z-scores) as the outcome variable and various student characteristics as the predictors, using generalized estimating equations (GEE) to account for clustering within pharmacy schools.[41] Crude analyses were performed for each student characteristic and thereafter adjusted for each other in multiple linear regression models. Listwise deletion was applied in the regression analysis, if a case lacked value on a student characteristic. Crude and adjusted results are presented with 95% confidence intervals (CIs). A 2-tailed *p*-value of <0.05 was considered statistically significant. A backward stepwise reduced model was built by only including significant factors (p≤ 0.20) from the crude analysis; thereafter, factors were removed from the model if p>0.05 (the least significant factor was removed first) and if removal of a factor did not change the beta coefficients more than 20%.[41] In a stratified analysis each country was analyzed separately to identify possible national differences.

Two sensitivity analyses were performed. In order to explore the impact of excluding items from the CSAS scale, linear regressions including all original items were conducted. Secondly, sensitivity analyses were performed by testing out the 6 various components solutions (see Appendix 1, Table 1 and 2) as compared to the chosen 1 component solution.

Results

Study population

Table 2 shows the student characteristics for the whole study population. In the study population the median age was 26 years; the majority were female (73.8%) and 56.9% of the students had at least one parent with a Nordic language as their mother tongue.

Attitudes towards learning communication skills

The average attitude score on CSAS (ACSAS) for the study population was 3.67 (SD: 0.49), see Table 2. Table 3 shows crude and adjusted associations between attitudes towards communication skills training and the main predictors. Females scored higher than males on attitudes to communication skills learning ($\beta_{adjusted}$:0.35:95% CI:0.13 to 0.57, p=0.002). Students in newer pharmacy training program scored higher than those in the oldest pharmacy training program within each country ($\beta_{adjusted}$:0.75:95% CI:0.55 to 0.95, p< 0.001). Students who thought

their skills needed improvement scored higher compared to students who thought their skills did not need enhancement ($\beta_{adjusted}$:0.48:95% CI:0.26 to 0.70, p< 0.001). Furthermore, students who thought their communication skills were a result of their personality scored lower compared to the reference group in the adjusted model ($\beta_{adjusted}$:-0.32:95% CI:-0.54 to -0.11, p=0.003).

All other factors studied were non-significant in the adjusted models (p≥ 0.05), see Table 3. Results from the final reduced stepwise regression model are shown in Table 4. After reduction, the same 4 student characteristics remained in the model: female gender (β:0.42:95% CI:0.20 to 0.63, p< 0.001), new pharmacy training program (β:0.81:95% CI:0.63 to 0.98, p< 0.001), students who thought their skills needed improvement (β:0.50:95% CI:0.30 to 0.71, p< 0.001) and students who thought their communication skills were a result of their personality (β:-0.24:95% CI:-0.44 to -0.04, p=0.017).

Stratified analysis per country

When analyzing each country separately the results showed similar effects size and overlapping CIs for Norway, Sweden and Denmark, see Table 1. in Appendix 2. Nevertheless, in Norway there was a trend that students with parents having a non-Nordic language (β:-0.77:95% CI:-1.18 to -0.37, p< 0.001) scored lower on attitudes towards communication skills training. Opposed to Denmark, where students with parents having a non-Nordic language scored higher on attitudes towards communication skills training (β:0.32:95% CI: 0.00 to 0.65, p= 0.05).

Sensitivity analyses

The results from the sensitivity analyses using the full item CSAS scale identified the same statistically significant associations of student characteristics with attitudes (results not shown). When the student characteristics were analyzed for the 6 different components solutions (scales, as single outcomes, see Appendix 1 Table 2), the adjusted GEE revealed similar results to the 1-component solution. Two student characteristics that were not significant in the main analysis (1 component) were identified in one of the adjusted component solutions: thinking one's skills were excellent/good and having a parent with a non-Nordic first language significantly predicted attitudes for 2 of the 6 components. For all remaining components, the results did not differ from the 1 component solution.

Discussion

This study is the first to examine Nordic pharmacy students' attitudes towards learning communication skills. The results show that Nordic pharmacy students in general have moderately positive attitudes towards learning communication skills. This is in line with previous findings for medical and dental students, who also have moderate to positive attitudes towards learning communication skills.[15,17-20,22-24,28-33] Furthermore, this study found important associations between having more positive attitudes towards learning communication skills and: being female, following a newer pharmacy training program within each country, higher self-rated need of communication skills improvement and believing personality is not important for one's communication skills, implying that they need to be learned. There were also tendencies that having more positive attitudes towards learning communication skills and wanting a more patient-centered career and for participation in extra communication course(s). No significant associations were shown between attitudes and age, parents' first language (ethnicity), having a parent working in the health-care sector (parent's occupational status), extra patient care work, level of self-rated communication skills, or placement of communication training in the adjusted models, which previous studies have found for medical and dental students.[15,17,18,22,23,27,29] Further no significant associations were shown between attitudes and pharmacy work experience or internship placement (hospital v. community pharmacy).

Gender gap?
-implications for education and practice

The results indicate that female pharmacy students are more likely, compared to male students, to have positive attitudes towards learning communication skills. Similar results are reported for medical and dental students.[15,17,19,20,22-24,27,28,30,31,33,42] Females might be socialized differently from males and thus oriented into a counseling role. For example, female physicians have been shown to have a more patient-centered communication style, i.e., to communicate more empathically and in a positive way, and to have longer consultations, compared to their male colleagues in primary care.[43] In addition, female dentists tend to use more communication techniques.[44] However, research is lacking on the impact on practice outcomes.[43] Very few studies in pharmacy have explored this association. A small sample size study, of 20 pharmacists

in Australia, exploring pharmacists' counselling behavior on antidepressants did not show such a relationship between gender and a patient-centered communication style.[45] Further, female medical and pharmacy students have been reported as earning higher communication grades, feeling more prepared to practice pharmacy and learning communication skills faster than male students, which has been found in other areas of education as well, although both genders benefit from communication skills training.[43,46-48] Studies using the CSAS in combination with an intervention reported that females gained or retained more positive attitudes compared to male students.[20,33] The identified gender gap has implications for educators in supporting male students so they can gain the same level of positive attitudes as females and, indirectly, proficiency in counseling.

Newer and oldest pharmacy training programs
- different students, socialization- and/or teaching processes?

Students from the newer pharmacy training programs in each country tended to have more positive attitudes compared to students following the oldest pharmacy training programs. This could suggest that the socialization and/or type of teaching traditions differ between pharmacy schools. A study of medical students showed that they were influenced and socialized by older students and qualified doctors to have negative attitudes towards communication skills and that it was socially acceptable to have such attitudes.[49] Two British studies found that different pharmacy schools had prepared pharmacy students differently for clinical skills, which might indicate variations between schools in their focus on clinical skills such as communication skills.[46,48] Those studies further support the findings that schools might socialize/emphasize counseling to different extents, which might result in different attitudes towards communication learning. A more conservative point of view regarding communication training might be more prominent in the oldest pharmacy training programs. For example older organizations, i.e. older schools, often have more traditions and reputations to maintain, and are less adaptive to change (e.g. introducing pharmaceutical care, communication skills training) and focus less on teaching.[50-52] Another part of the explanation could be the size of the institution and the student classes (in the Nordic context, newer pharmacy schools often have smaller classes), which can impact the culture of the school, where smaller student groups might lead to more student involvement, feelings of belonging and satisfied students.[53] Further there might be a variation in

demography of teaching staff between schools. For example, newer programs might have a greater proportion of younger teachers, which are more flexible to introduce subjects not always placed at the core of pharmaceutical education traditions. It cannot be ruled out that students applying to older pharmacy schools may be less positive towards communication skills learning from the outset (their preferred future work prospects might have an influence here). On the other hand, adjusting for current preferred future work prospects did not alter the results; hence this would require a longitudinal follow-up study of pharmacy students over the duration of their training. In addition, since this was not an *a priori* hypothesis (oldest/newer training program) it must be interpreted with some caution and explored further.

The results of this and other studies indicate that differences in the type of teaching, both in the general curricula and specifically in the patient communication training programs, appear to impact students' attitudes.[15,17,22] In this study, the association between attitudes and the placement, inclusion of patient communication training only in PPE or also in additional courses, diminished when controlling for the other factors. However, findings in the literature point in different directions: some have found that a more extensive patient communication skills curriculum resulted in less positive attitudes while others have found the opposite.[15,17,20,22,30,33] Discrepancies might be due to differences in study designs, adjustments of confounders and statistical treatment of the CSAS. For example, a Finnish study using the CSAS before 3 educational interventions and in close connection with clinical practice showed a significant increase in positive attitudes after the experiential training interventions for both genders.[20] The Australian study with pharmacy students, partly using the CSAS, found an increase in positive agreement for some items after training.[35] Researchers who found a decline in attitudes at the end of medical school explained it in terms of students' feeling that the idealistic training did not match up with patient encounters in the real world.[33] This implies that students are affected by how, when and where patient communication training is being taught; realistic, well received- and placed training (probably in close connection with clinical practice) will influence attitudes in a positive direction.[17,20,29,33]

Higher self-rated need of communication skills improvement

Previous studies have found that medical and dental students who reported that their skills needed improvement were also more likely to have positive attitudes.[15,24,27] The same association was found in the present study. Rees et al. explained this by arguing that these were students who appeared to value the opportunity to learn communication skills more highly as compared to their fellows who thought they did not need any improvements.

Believing personality is important for one's communication skills leaves little room for improvement

Students strongly agreeing with the assertion that their communication skills are a result of their personality had less positive attitudes. This belief might have consequences for receptiveness of learning and using communication skills, and educators should therefore raise this issue in the training, for example by giving the students concrete examples of communication training actually increasing students' level of skills and/or that it influences patient outcomes positively. Indeed, personality has been shown in the medical encounter to modestly explain around 4-7% of the variance in patient-centered communication for depressive symptoms in primary care, in addition to physician demographics, training and patient presentation.[54] Research suggests that communication skills and style can be trained.[47,55] A German study indicated an improvement on several communication skills after a course for medical students including basic communication theories and techniques (question asking, building a provider-patient relationship etc.) as well as role-play and simulated patients.[47] Knowing more in-depth about students' believes about personality types could allow for tailoring the teaching better for individuals.[54]

Strengths, limitations and future research suggestions

It is the first study on Nordic pharmacy students on this matter. The study included a rather large sample of pharmacy students with various student characteristics, allowing adjustments for, and exploring, a variety of factors potentially associated with attitudes towards communication skills learning. Few other studies have used regression models and controlled for other factors, mainly due to highly skewed data when using sub-scales of CSAS.[15,17] Therefore, differences in statistical procedures and handling of the CSAS (see next paragraph) might explain why some previous indications of associations are not seen here. Nevertheless, overall the study found similar results as others have.

The present study had a few limitations. Attitudes are known to be difficult to capture in a questionnaire and socially desirable answers might have impacted the results.[7] The cross-sectional design of the study means that no causal inferences can be drawn from the observed associations. Longitudinal studies are needed to study stability and changes in attitudes. At some schools, the response rate might limit the representativeness of the study sample, for example in Iceland. In addition, Finnish pharmacy schools, which have done a lot of research on the communication aspects/parts of the education and invested great resources in the patient communication teaching,[56-59] were excluded because of a very low response rate. They would probably have added interesting insights to the analysis.

The principal component analysis proposed a 1-component version of the CSAS, which adds to the, at least, 6 existing different versions reported in the literature.[19] The proposed scale need to be further explored in similar samples. Many different versions make comparisons among studies difficult. Initially Rees et al. had a 6-component solution, but chose to use a 2-component solution (negative and positive attitudes).[14] This raises questions about the final validity of the scale. As mentioned earlier in the text, differences in the underlying sample, including sample size, culture or inclusion of different professions (e.g. pharmacists v. dentists), could be potential reasons for the different components' solutions. Further, it can be argued that a 1-component solution might be sufficient to capture students' general attitudes, rather than dividing them into positive and negative, which actually measures the same thing; either there will be more positive or more negative attitudes. By using a 1-component solution, normally distributed data was obtained compared to other researchers' solutions with more than one component which produced highly skewed data.[15,17] Nevertheless, Anvik et al. argue that by including sophisticated domains instead (not only positive and negative), it is possible to distinguish between easily influenced and more stable and basic cognitive attitudes.[60] This can be of interest when trying to influence attitudes by introducing teaching changes or to understand variations of attitudes towards different training approaches.[17]

Taking into consideration the results of the pilot study, the level of competence in English in the Nordic countries,[61,62,63] and potential translation losses, the questionnaire was administered in

English.[38] This may have led to misunderstandings even though, in general in the Nordic countries, the level of English among adults is considered high.[62,63] In addition, the study population was in their final years of pharmacy studies, which supports the assumption that they had a high level of English (e.g. many of their textbooks are in English). Some of the questions were negatively worded, which can cause difficulties among respondents, especially those who are less educated,[7] but this should not have been the case in this study population.

Future research could explore the CSAS validity among other pharmacy student populations. Focus on how attitudes towards learning communication skills affect pharmacists' counseling behavior would be warranted, as would the way gender influences the encounter. Further qualitative research would be beneficial for increasing our understanding of pharmacy students' attitudes towards learning communication skills. For example on how students understand the concept of communication skills and its relationship with their professional life; and on their beliefs about role of personality in the learning process.

Conclusions

Nordic pharmacy students in general have moderately positive attitudes towards learning communication skills. The results of this study imply that different factors such as gender, pharmacy training programs, willingness to improve one's own skills and a belief in the role of personality are important factors for attitudes towards learning communication skills in the Nordic countries. This provides important information for faculty members responsible for curriculum improvements and teachers to refine their teaching of communication skills, while also taking the local context, e.g. university culture, into account. Based on this, teaching can be better tailored to suit different students, thereby increasing the likelihood of their being able to help patients effectively in their future professional life.

Funding

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Table 1. Response rates for the included pharmacy schools (universities).

School	Year in the program	Size (N)	Response Rate	
			N	Percent (%)
University of Copenhagen	4^1	142	119	84
University of Southern Denmark	5^2	36	21	58
University of Iceland	5^2	12	7	58
University of Oslo	4^2	54	40	74
University of Bergen	4^2	21	19	90
University of Bergen	5^2	17	11	65
University of Tromsø	4^2	29	20	69
University of Gothenburg	5^1	91	71	78
Umeå University	5^1	17	11	65
Uppsala University	5^1	60	51	85
Total		479	370	77

1. Have had all the mandatory courses, but missing a part (<40%) of the pharmacy practice experience period.

2. Have had all their mandatory courses.

Table 2. Student characteristics of the study population and attitudes towards learning communication skills; raw-score (ACSAS) (N=367).

Variable	N(%)	Raw score ACSAS (SD)
Total	367	3.67 (0.49)
Age		
Median (Range)	26.0 (24-57)	n.a.
24-26	219 (59.7)	3.66 (0.50)
27+	142 (38.7)	3.67 (0.48)
Gender		
Female	271 (73.8)	3.72 (0.46)
Male	94 (25.6)	3.50 (0.51)
Parents' first language(s)		
Nordic	209 (56.9)	3.65 (0.43)
Non-Nordic	143 (39.0)	3.67 (0.52)
Do any of your parents work in a health care setting?		
Yes	104 (28.3)	3.67 (0.46)
No	259 (70.6)	3.65 (0.55)
At which university are you studying[1]?		
University of Copenhagen (DK) (oldest)	118 (32.2)	3.41 (0.48)
University of Gothenburg (SE) (newer)	70 (19.1)	3.89 (0.43)
Uppsala University (SE) (oldest)	50 (13.6)	3.60 (0.39)
University of Oslo (NO) (oldest)	40 (10.9)	3.53 (0.47)
University of Bergen (NO) (newer)	30 (8.17)	4.08 (0.31)
University of Southern Denmark (DK) (newer)	21 (5.72)	3.88 (0.36)
University of Tromsø (NO) (newer)	20 (5.45)	3.79 (0.47)
Umeå University (SE) (newer)	11 (3.00)	3.98 (0.35)
University of Iceland (ICE) (oldest)	7 (1.91)	3.71 (0.41)
Placement of patient communication training		
Only in the PPE	259 (70.6)	3.62 (0.49)
PPE and in additional courses	108 (29.4)	3.79 (0.47)
Have you taken any extra communication course?		
Yes	39 (10.6)	3.73 (0.51)

No	325 (88.6)	3.65 (0.48)
Where did you do the main body of the PPE?		
At a community pharmacy	314 (85.6)	3.66 (0.49)
Parts or the whole PPE at a hospital pharmacy	43 (11.7)	3.75 (0.47)
Work experience in a pharmacy including patient contact e.g. during summers or on weekends?		
Yes	200 (54.5)	3.73 (0.51)
No	163 (44.4)	3.59 (0.45)
Work experience of patient care such as in a hospital etc.?		
Yes	97 (26.4)	3.67 (0.50)
No	267 (72.8)	3.67 (0.49)
Where would you like to work when you graduate[2]?		
Only community pharmacy and/or hospital	54 (14.7)	3.78 (0.48)
Only pharmaceutical industry and/or university and/or governmental inst.	121 (33.0)	3.50 (0.51)
Mixed (both fields)	187 (51.0)	3.74 (0.44)
How would you rate your communication skills[3]?		
Excellent	29 (7.90)	3.42 (0.59)
Good	220 (59.9)	3.71 (0.47)
Average	107 (29.2)	3.68 (0.49)
Poor	6 (1.63)	3.31 (0.23)
Very poor	1 (0.27)	n.a.
I believe my communication skills need improvement[4]		
Strongly agree	60 (16.3)	3.86 (0.44)
Agree	196 (53.4)	3.73 (0.43)
Neutral	69 (18.8)	3.48 (0.50)
Disagree	26 (7.08)	3.50 (0.55)
Strongly disagree	9 (2.45)	3.10 (0.80)
I believe my communication skills are a result of my personality[5]		
Strongly agree	119 (32.4)	3.54 (0.56)
Agree	176 (48.0)	3.72 (0.46)
Neutral	55 (15.0)	3.75 (0.40)

Disagree	9 (2.45)	3.86 (0.46)
Strongly disagree	2 (0.54)	3.59 (0.17)

PPE= pharmacy practical experience. ACSAS=Average raw-score for the CSAS. Numbers do not add up due to missing numbers. Missing values under 4.00 % is not shown. Data was missing for (n): language=15 (4.09%).

1. Newer= Newer pharmacy training program within each country, ACSAS=3.92 (0.41); Oldest= Oldest pharmacy training program within each country, ACSAS=3.49 (0.46).

2. Only community pharmacy and/or hospital/Mixed (both fields), ACSAS=3.78 (0.48); Only pharmaceutical industry and/or university and/or governmental inst. ACSAS=3.50 (0.51).

3. Excellent/Good, ACSAS=3.67 (0.49); Average/Poor/Very Poor, ACSAS=3.66 (0.48).

4. Yes (strongly agree/agree), ACSAS=3.76 (0.44); No (disagree/strongly disagree)/Neutral, ACSAS=3.45 (0.54).

5. Strongly agree, ACSAS=3.54 (0.56); Agree/Neutral/Disagree/Strongly disagree, ACSAS=3.73 (0.44).

Table 3. Crude and adjusted associations between attitudes towards communication skills training (z-scores of ACSAS) and student characteristics (N=367[1]).

Student characteristic	Crude β estimate (95% CI)	Adjusted β estimate (95% CI)
Age		
24-26	Ref	Ref
27+	0.04 (-0.17 to 0.25)	-0.08 (-0.27 to 0.11)
Gender		
Male	Ref	Ref
Female	0.45 (0.21 to 0.69)***	0.35 (0.13 to 0.57)**
Parents' first language(s)		
Nordic	Ref	Ref
Non-Nordic	-0.04 (-0.25 to 0.16)	0.00 (-0.20 to 0.20)
Parents working in health care sector		
No	Ref	Ref
Yes	-0.03 (-0.28 to 0.21)	-0.11 (-0.31 to 0.10)
Type of education		
Oldest pharmacy training programs within each country	Ref	Ref
Newer pharmacy training programs within each country	0.89 (0.71 to 1.07)***	0.75 (0.55 to 0.95)***
Placement of patient communication training		
Only in the PPE	Ref	Ref
PPE and in additional courses	0.36 (0.14 to 0.57)***	0.11 (-0.14 to 0.36)
Extra communication course(s)		
No	Ref	Ref
Yes	0.16 (-0.18 to 0.50)	0.30 (-0.04 to 0.63)[2]
PPE placement		
At a community pharmacy	Ref	Ref
Parts or the whole PPE at a hospital pharmacy	0.19 (-0.12 to 0.49)	0.03 (-0.27 to 0.33)
Work experience in a pharmacy		

No	Ref	Ref
Yes	0.28 (0.08 to 0.48)**	-0.02 (-0.23 to 0.20)
Work experience in a hospital etc.		
No	Ref	Ref
Yes	0.01 (-0.23 to 0.24)	-0.02 (-0.23 to 0.18)
Where would you like to work when you graduate?		
Pharmaceutical industry and/or university and/or governmental inst.	Ref	Ref
Community pharmacy and/or hospital/ Mixed (both fields)	0.52 (0.30 to 0.73)***	0.21 (-0.02 to 0.44)[3]
Self-rated level of communication skills		
Average/Poor/Very Poor	Ref	Ref
Excellent/Good	0.02 (-0.20 to 0.24)	0.17 (-0.06 to 0.39)
Self-rated need of communication skills improvement		
No (Neutral/ Disagree/ Strongly disagree)	Ref	Ref
Yes (Strongly agree/ Agree)	0.62 (0.39 to 0.86)***	0.48 (0.26 to 0.70)***
I believe my communication skills are a result of my personality		
Agree/Neutral/Disagree/Strongly disagree	Ref	Ref
Strongly agree	-0.38 (-0.61 to -0.15)***	-0.32 (-0.54 to -0.11)**

PPE=pharmacy practical experience. * $p \leq 0.05$; ** $p \leq 0.01$; ***$p \leq 0.001$. Values represent betas (based on z-scores) and 95% confidence intervals derived from linear crude and adjusted regression analyses. All adjusted regressions control for each of the student characteristics.

1. Listwise deletion was applied in the crude and adjusted regression analysis, if a case lacked value on a student characteristic. The final adjusted model included 329 students.

2. p=0.085

3. p=0.08.

Table 4. Multivariate stepwise reduced regression model for attitudes towards communication skills training (z-scores of ACSAS) and student characteristics. (N=367[1]).

Student characteristic	Adjusted β estimate (95% CI)
Gender	
Male	Ref
Female	0.42 (0.20 to 0.63)***
Type of education	
Oldest pharmacy training programs within each country	Ref
Newer pharmacy training programs within each country	0.81 (0.63 to 0.98)***
Self-rated need of communication skills improvement	
No (Neutral/ Disagree/ Strongly disagree)	Ref
Yes (Strongly agree/ Agree)	0.50 (0.30 to 0.71)***
I believe my communication skills are a result of my personality	
Agree/Neutral/Disagree/Strongly disagree	Ref
Strongly agree	-0.24 (-0.44 to -0.04)*[2]

* p≤ 0.05; ** p≤ 0.01; *** p≤ 0.001. Values represent betas (based on z-scores) and 95% confidence intervals derived from linear multiple regression analyses. A backward elimination stepwise selection model was performed.

1. Listwise deletion was applied in the adjusted regression analysis, if a case lacked value on a student characteristic. The final adjusted model included 356 students.

2. p=0.017.

Appendix 1.
Principal component analysis

An explorative factor analysis using principal component analysis (PCA) was conducted to test the construct of the scale in this study population using direct oblimin rotation. The Kaiser-Meyer-Olkin measure was 0.886 and a positive p-value of <0.001 was revealed by Bartlett´s test of sphericity, both results showing the adequacy for conducting a PCA. The PCA derived 6 initial components with an eigenvalue > 1, explaining 53% of the variation (see Table 1). One component explained the majority of the variance; 26%. Items were assigned to one component, if they loaded at least 0.3 on one component and with multiple loading the item was assigned to the component making most theoretical sense.[40,64] It was decided to use a reduced 1-component solution, including 17 out of the 26 items. Component 2 was excluded because it does not directly measure attitudes towards communication skills training, rather evaluates the outcome of the teaching (Table 2). Component 3 and 4 and were excluded, because they did not fit theoretically. Component 1, 5 and 6 measures attitudes, and were combined into 1 component (α=0.852) and used as the outcome (ACSAS) in analysis, see Table 3. A higher score indicates stronger positive attitudes towards learning communication skills.

Table 1. Principal component analysis: initial eigenvalues (N=367).

Initial Eigenvalues			
Component	**Total**	**% of Variance**	**Cumulative %**
1	6.715	25.828	25.828
2	1.953	7.512	33.340
3	1.452	5.586	38.926
4	1.277	4.911	43.837
5	1.252	4.814	48.651
6	1.038	3.994	52.645

Extraction Method: Principal Component Analysis.

Table 2. Pattern Matrix with loadings for each item on the 6 components with wording of items and measures of internal reliability (N=367).

Pattern Matrix[a]

	Component					
	1	**2**	**3**	**4**	**5**	**6**
Component 1. "Motivation" 5 items (7, 12,18,21,23) – Cronbach's α =0.746						
12. Learning communication skills is fun	**.736**					
7. Learning communication skills is interesting	**.710**					
18. When applying to pharmacy school. I thought it was a really good idea to learn communication skills	**.588**					
24. I find it difficult to take communication skills learning seriously*[X]	.578					**.322**
23. Learning communication skills is applicable to learning pharmacy[X]	**.389**			-.392		
21. I think it's really useful learning communication skills on the pharmacy degree[X]	**.379**				-320	
Component 2. "Learning outcomes" 5 items (14,10,5,9,16) – Cronbach's α =0.767						
14. Learning communication skills has helped or will help me respect my colleagues		**-.698**				
10. Learning communication skills has improved my ability to communicate with patients		**-.686**				
5. Learning communication skills has helped me or will help me respect patients		**-.681**				
9. Learning communication skills has helped or will help facilitate my team working skills		**-.665**				
16. Learning communication skills has helped or will help me recognize patients' rights regarding confidentiality and informed consent		**-.588**				
Component 3. "System" 3 items (22,3,6) – Cronbach's α =0.476						
22. My ability to pass exams will get me through pharmacy school rather than my ability to communicate*[X]	.365		**.640**			

3. Nobody is going to fail their pharmacy degree for having poor communication skills*		**.641**	
6. I haven't got time to learn communication skills* [X]		**.600**	

Component 4. "Confidence" 1 item (20)

20. I find it hard to admit having some problems with my communication skills* | | | **.838** |

Component 5. "Importance" 6 items (1, 2,4,19,25,26) – Cronbach's α =0.766

1. In order to be a good pharmacist I must have good communication skills		**-.788**
19. I don't need good communication skills to be a pharmacist*		**-.696**
2. I can't see the point in learning communication skills*		**-.651**
26. Communication skills learning should be left to psychology students. not pharmacy students* [X]	.309	**-.500**
25. Learning communication skills is important because my ability to communicate is a lifelong skill		**-.407**
4.Developing my communication skills is just as important as developing my knowledge of pharmacy		**-.351**

Component 6. "Seriousness/Teaching process" 5 items (8,11,15,13,17, (24)) – Cronbach's α =0.593

15. I find it difficult to trust information about communication skills given to me by non- clinical lecturers*		**.579**
13. Learning communication skills is too easy* [X]	-.314	**.524**
17. Communication skills teaching would have a better image if it sounded more like a science subject*		**.502**
8. I can't be bothered to turn up to sessions on communication skills*		**.502**
11. Communication skills teaching states the obvious and then complicates it*		**.403**

Extraction Method: Principal Component Analysis. Rotation Method: Oblimin with Kaiser Normalization.

a. Roation converged in 21 iterations.* Item is negative and the score is reversed. [X] Item was included in the component in bold.

Table 3. Component Matrix with loadings for the final 1-component solution measures of internal reliability (N=367).

Component Matrix[a]	Component 1.
Component 1. Attitudes towards communication skills training α=0.852	
26. Communication skills learning should be left to psychology students, not pharmacy students*	.778
12. Learning communication skills is fun	.748
7. Learning communication skills is interesting	.733
21. I think it's really useful learning communication skills on the pharmacy degree	.709
24. I find it difficult to take communication skills learning seriously*	.705
25. Learning communication skills is important because my ability to communicate is a lifelong skill	.649
19. I don't need good communication skills to be a pharmacist*	.617
4. Developing my communication skills is just as important as developing my knowledge of pharmacy	.576
1. In order to be a good pharmacist I must have good communication skills	.538
11. Communication skills teaching states the obvious and then complicates it*	.473
2. I can't see the point in learning communication skills*	.472
23. Learning communication skills is applicable to learning pharmacy	.463
8. I can't be bothered to turn up to sessions on communication skills*	.435
18. When applying to pharmacy school, I thought it was a really good idea to learn communication skills	.397
13. Learning communication skills is too easy*	.340
15. I find it difficult to trust information about communication skills given to me by non- clinical lecturers*	.310
17. Communication skills teaching would have a better image if it sounded more like a science subject*	.265

Extraction Method: Principal Component Analysis.

a. 1 components extracted.

* Item is negative and the score is reversed.

Appendix 2.

In a stratified analysis each Nordic country is presented individually; except for Iceland which was excluded due to low sample size (N=7). Variables including a category with< 15 students are not shown (n.a). Adjusted analysis is not performed due to power.

Table 3. Crude associations between attitudes towards communication skills training and student characteristics (N=367[1]).

Student characteristic	Total sample (N=367[1])	Norway (N=90[1])	Sweden (N=131[1])	Denmark (N=139[1])
	Crude β estimate (95% CI)	Crude β estimate (95% CI)	Crude β estimate (95% CI)	Crude β estimate (95% CI)
Age				
24-26	Ref	Ref	Ref	Ref
27+	0.04 (-0.17 to 0.25)	0.06 (-0.37 to 0.50)	0.01 (-0.30 to 0.31)	-0.20 (-0.54 to 0.15)
Gender				
Male	Ref	Ref	Ref	Ref
Female	0.45 (0.21 to 0.69)***	0.45 (-0.04 to 0.95)	0.32 (0.01 to 0.64)*	0.41 (0.02 to 0.79)*
Parents' first language(s)				
Nordic	Ref	Ref	Ref	Ref
Non-Nordic	-0.04 (-0.25 to 0.16)	-0.82 (-1.20 to -0.44)***	-0.04 (-0.35 to 0.26)	0.32 (0.00 to 0.65)*
Parents working in health care sector				
No	Ref	Ref	Ref	Ref
Yes	-0.03 (-0.28 to 0.21)	0.09 (-0.37 to 0.54)	0.00 (-0.33 to 0.33)	-0.32 (-0.76 to 0.11)
Type of education				
Oldest pharmacy training programs within each country	Ref	Ref	Ref	Ref
Newer pharmacy training programs within each country	0.89 (0.71 to 1.07)***	0.90 (0.52 to 1.27)***	0.63 (0.34 to 0.92)***	0.97 (0.61 to 1.32)***
Placement of patient communication training				
Only in the PPE	Ref	Ref	Ref	Ref
PPE and in additional courses	0.36 (0.14 to 0.57)***	n.a.	n.a.	n.a.
Extra communication course(s)				

No	Ref	Ref	Ref	Ref
Yes	0.16 (-0.18 to 0.50)	n.a.	n.a.	n.a.
PPE placement				
At a community pharmacy	Ref	Ref	Ref	Ref
Parts or the whole PPE at a hospital pharmacy	0.19 (-0.12 to 0.49)	0.12 (-0.36 to 0.61)	n.a.	n.a.
Work experience in a pharmacy				
No	Ref	Ref	Ref	Ref
Yes	0.28 (0.08 to 0.48)**	n.a.	0.30 (0.00 to 0.60)*	-0.38 (-0.80 to 0.04)
Work experience in a hospital etc.				
No	Ref	Ref	Ref	Ref
Yes	0.01 (-0.23 to 0.24)	0.04 (-0.41 to 0.48)	-0.10 (-0.44 to 0.25)	-0.35 (-0.68 to -0.01)*
Where would you like to work when you graduate?				
Pharmaceutical industry and/or university and/or governmental inst.	Ref	Ref	Ref	Ref
Community pharmacy and/or hospital/ Mixed (both fields)	0.52 (0.30 to 0.73)***	n.a.	0.23 (-0.09 to 0.55)	0.48 (0.16 to 0.81)**
Self-rated level of communication skills				
Average/Poor/Very Poor	Ref	Ref	Ref	Ref
Excellent/Good	0.02 (-0.20 to 0.24)	-0.02 (-0.42 to 0.38)	-0.17 (-0.63 to 0.29)	-0.08 (-0.41 to 0.25)
Self-rated need of communication skills improvement				
No (Neutral/ Disagree/ Strongly disagree)	Ref	Ref	Ref	Ref
Yes (Strongly agree/ Agree)	0.62 (0.39 to 0.86)***	n.a.	0.42 (0.09 to 0.76)**	0.73 (0.37 to 1.10)***
I believe my communication skills are a result of my personality				
Agree/Neutral/Disagree/Strongly disagree	Ref	Ref	Ref	Ref
Strongly agree	-0.38 (-0.61 to -0.15)***	-0.43 (-0.88 to 0.02)	-0.30 (-0.68 to 0.08)	-0.29 (-0.66 to 0.07)

1.Listwise deletion was applied in the crude and adjusted regression analysis, if a case lacked value on a student characteristic. * p≤ 0.05; ** p≤ 0.01; *** p≤ 0.001.

Values represent betas (based on z-scores) and 95% confidence intervals derived from linear regression analyses