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Measuring Outcomes of Interprofessional Education: A Validation Study of the Self-Assessment of Collaboration Skills Measure

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Abstract

Increased attention is being focused on the need for interprofessional collaboration between professional actors, in various fields. In turn, this creates a demand for validated, context-neutral instruments to measure outcomes of interprofessional education. The initial validation of one such measure, the Self-Assessment of Collaboration Skills (SACS) measure, has shown promising results in this regard. The aim of this article has been to contribute to the validation process of the SACS measure by presenting the results of a cross-validation of the measure in a sample of Norwegian students (N= 499) attending a children and youth-focused IPE programme. The study's findings both indicated that the measure is quite stable across the different settings and supported the claim that the SACS is a context-neutral instrument—one that is well-suited to measuring collaboration skills in various IPE settings. These findings may prove important for professionals seeking to evaluate IPE programmes with broad study profiles.

Keywords

Interprofessional collaboration, interprofessional education, instrument validation, collaboration skills measure, IPE programmes with broad study profiles, SACS

Interprofessional educational programmes with broad study profiles

Interprofessional collaboration (IPC) is relevant within a diverse range of contexts and fields. The need for collaboration across professional boundaries when working with children and youth (0–18 years) is highlighted through national[1] and international[2] political documents. Just as important is the recognised need for IPC from the point of view of the actors themselves. In Norway, the formal responsibility for ensuring that children and youth benefit from good conditions during their upbringing is often divided among various agencies and professions. All children in Norway will interact with professional actors in their everyday lives in general health care settings, kindergarten, schools, after school care etc. Some children will also interact with professionals in more specialised services such as specialised health care or through children's protective services. However, the distribution of roles and communication between the different professions is not always as clear or effective as one would wish. Communication and collaboration among the various parties may thus be insufficient, and hence the services offered become fragmented and badly coordinated. Another troubling issue is that it is easy to neglect the children's and youths' own opinions under these circumstances. It is thus necessary to increase collaboration among the involved professions, to better meet the needs of all children and youth in their vital years of growing up (Gulbrandsen, 2014; Johannessen & Skotheim, 2018).

The increasing demand for IPC may also be recognised by recent debates on the development of professions, highlighting the increasing differentiation and heterogeneity within and between professional groups (Pacchi & Mariotti, 2021). In a recent editorial in this journal Parding, Bellini, and Maestripieri (2021, p. 1) argue: *"that the transformation towards a post-industrial society has impacted on the composition of professional groups, on the relations between different professional groups, as well as on the role of professionals in society."* When collaborating across disciplines, professionals may encounter boundaries between different perspectives and practices (Akkerman & Bakker, 2011b). In this context, a boundary can be understood as: *"a socio-cultural difference leading to discontinuity in action or interaction"* (Akkerman & Bakker, 2011a, p. 133). Well-orchestrated IPC is one way to explore and negotiate boundaries within and across professions.

The overall attention drawn to interprofessional collaboration has also affected the field of interprofessional education (IPE). Interprofessional professional qualification has been and still is, high on the political agenda, both in Norway and internationally (Hagland & Koren Solvang 2017). This has resulted in a widespread growth of interprofessional educational programmes across, within, and beyond the health and social care sectors—which are

[1] For example: Report no. 13. (2011-2012). Education for Welfare—Interaction as Key; Report no. 20. (2012-2013). On the right track.

[2] WHO Framework for Action on Interprofessional Education and Collaborative Practice

offered to learners at all levels (from undergraduate students to continuing education) and in various settings (Barr, Gray, Helme, Low, & Reeves, 2016; Molloy, Greenstock, Fiddes, Fraser, & Brooks, 2014; Reeves et al., 2016). The increase in—and diversity of—the IPE programmes offered are, in turn, influencing the evaluation field of IPE. Reliable instruments to measure the impact of IPE are essential, to ensure the quality of IPE evaluations (Mahler, Berger, & Reeves, 2015).

This article takes, as its point of departure, the assessment of learning in an interprofessional educational programme (INTERACT), which focuses on the effective learning and teaching of interprofessional work with children and youth. INTERACT is developed as an IPE programme for a broad spectrum of university students on their path into professions within education, health, and social care. This broad professional landscape requires a suitable instrument to evaluate the programme. Currently, few non-context specific instruments are readily accessible to evaluators seeking to assess the development of interprofessional collaboration skills in learners (Hinyard, Toomey, Eliot, & Breitbach, 2019) within a wider professional landscape. The purpose of this study is to contribute to the validation process of one such instrument—the *Self-Assessment of Collaboration Skills (SACS) measure* (ibid.)—through a cross-validation of the measure, based on data from Norwegian students attending INTERACT.

The research questions to be discussed in this article are:

1) *To what extent can the original factor structure of the SACS be retraced, when the SACS items are answered by Norwegian students?*

2) *To what extent do scores on the SACS measure vary with background factors—such as educational programme, age, etc.—among Norwegian students?*

The Use of IPE instruments to measure the impact of IPE interventions

For the past two decades, researchers within the IPE field have developed a range of instruments to measure the impact of IPE interventions across various educational and health care settings (Mahler et al., 2015); Schmitz & Cullen, 2015). The use of scales to measure IPE activities has become a dominant feature in the research discourse (Lawn, 2016). However, even where instruments are commonly applied, Mahler and colleagues argue that these instruments' psychometrics—as well as the theoretical frameworks upon which the instruments are based—should be critically examined before use (Mahler et al., 2015). Few systematic reviews of existing instruments, and subsequent evidence of their validity, are found in the scholarly literature (Schmitz & Cullen, 2015). Still, there are some exceptions. Thannhauser, Russell-Mayhew, and Scott (2010) systematic review of quantitative instruments currently available for research evaluating IPE and IPC is of particular interest for the current study. The authors focused on those measures applicable to a broad range of occupations and settings. Included instruments had to be relevant to a

wide range of professions. They found that, although a substantial number of instruments are available to be used to measure various aspects of IPE/IPC, only a limited number of these are relevant when assessing professions working/learning together within a broader health care setting. They concluded: *"Despite the numerous tools available for measuring different aspects of IPE and IPC within a broad field of study, there are limited choices with sound psychometric properties and adequate time spent on development"* (Thannhauser et al., 2010, p. 340).

Even as the use of instruments has become a dominant feature in IPE evaluations and there are a number of such tools available, there is still a lack of validated instruments measuring central aspects of IPE that can be applied to professionals working/learning together beyond the traditional IPE boundaries—that is, between various health care professions or between health and social care professions, respectively. This article aims to contribute to filling this gap.

Collaboration: A key characteristic of interprofessional education

Interprofessional education is commonly described as comprising *"occasions when members or students of two or more professions learn with, from and about each other to improve collaboration and the quality of care and services"* (Statement of Purpose CAIPE 2016). Working interprofessionally hence requires not just a willingness to learn *about* others and *from* others, but *with* others, to produce new *common knowledge* (Edwards, 2012). A part of this is accepting that knowledge creation can only happen through collaboration with others (Hean, Craddock, & Hammick, 2012). A key characteristic of IPE is, consequently, the social dimension of the learning situation (ibid.). Adhering to such a learning perspective, learners in IPE settings share their knowledge and understanding to negotiate meaning (Maddux, 1997, in Hean et al. 2012). Their success relies upon the learners' ability and willingness to enter into new experiences; to reflect upon them; and, finally, to make use of them (Barr, 2013).

The responsibility for the learning thus rests not only on the individual but on the whole group, as a *community of practice* (Lave & Wenger, 1991). Each member contributes to a socially constructed learning process—in which meaning is negotiated through an exchange among learners, and where reflections on new experiences from different perspectives and the alignment of values are central (Barr et al., 2016).

This is in line with what Edwards (2011, p. 33) writes about "responsive collaboration" and "relational expertise". She suggests that *"responsive collaboration calls for an additional form of expertise which makes it possible to work with others to expand understandings of the work problem (…)"*. Ideally, successful IPE should facilitate this. Responsive collaboration thus concerns the capability of recognising the knowledge that underpins one's own professional practice and being able to identify and adjust to the interpretations of others (ibid.). From such an encounter, another level of understanding—what Edwards (2012)

refers to as *"common knowledge",* where professional boundaries are respectively both included and exceeded—may also occur.

A key feature of interprofessional education, then, becomes the development of interprofessional collaboration skills among attending students: *"IPE aims to enhance attitudes, knowledge, skills, and behaviors for collaborative practice, which in turn can make improvements to clinical practice"* (Reeves et al., 2016, p. 656). Yet there is no clear-cut understanding of what this entails. Ødegård and Bjørkly (2012) describe how systematic literature reviews depict the complexity of interprofessional collaboration—namely with a diversity of definitions and collaboration models. It is important to take this diversity into consideration when developing, or presenting, an instrument to measure collaboration skills. A key challenge—when designing IPE evaluations based on the theoretical framework presented above—may accordingly be to find instruments that take the students' ideas and self-assessment of their collaborative orientation and activities in their interprofessional learning group, into account.

"Collaboration" in the SACS

The measure used in this study, the *Self-Assessment of Collaboration Skills*, was chosen in line with a theoretical framework that emphasises processes of joint meaning-making and mutual support in interprofessional group work. The SACS consists of three dimensions of collaboration: information sharing, learning, and team support (Hinyard et al., 2019). The developers used the Collaboration Skills Assessment Tool (CSAT) (Ofstedal & Dahlberg, 2009), an educational rubric used as a tool to develop an awareness of one's collaboration skills, as a starting point for the development of the SACS. However—where the CSAT includes both intrapersonal and interpersonal skills believed to be associated with collaboration—the SACS focuses solely on interpersonal skills, as it is argued that the two domains refer to separate constructs (Hinyard et al., 2019). The SACS is further developed as a self-reporting measure for students' skills and behaviours, rather than as a measure of their perceptions about the value of those behaviours, or their attitude towards them (ibid.). In their validation article, Hinyard et al. (2019) conclude:

> The SACS measure also helps to provide a comprehensive measure of collaboration that assesses not only a student's ability to contribute to and support fellow team members' performance but also examines his or her ability to engage in productive conversations and contribute to the learning of the team. Previous measures have often examined these dimensions separately (Edmondson, 1999; Garvin et al., 2008; Ofstedal & Dahlberg, 2009; Van Dyne & LePine, 1998). Thus, the SACS integrate these skills as being representative of the larger collaboration construct. (p. 19)

The distinction of the scale between intra- and interpersonal skills believed to be associated with collaboration skills is an important one. It can be argued that the focus on

interpersonal skills fits well with the social learning dimension of IPE, as described by Hean et al. (2012), Barr (2013), Barr et al. (2016), and Edwards (2011, 2012).

INTERACT: An IPE programme focusing on the everyday life of children and youth

INTERACT, the IPE programme from which the current study's data is gathered, aims to increase future collaboration among professionals who may form a part of children's and youths' everyday lives. The programme is offered to students attending seven different professional programmes[3]at Oslo Metropolitan University.

The rationale behind INTERACT can be found in the Norwegian model for the care of children and youth. Legally[4], in Norway, it is primarily the task of parents to raise, nurse, and take care of children in ways that provide them with a good childhood (Gulbrandsen, 2014). Yet various public services within the fields of education, health, and social care also take part in children's lives in modern welfare states like the Norwegian. Through INTERACT, participating students should gain knowledge and experience of cooperation with participants from other professional paths and should learn about communication and cooperation with children, youths, and their families.

This specific IPE focus, in turn, has had implications for the evaluation process of which the current study forms part. In the case of INTERACT, it proved difficult to find a suitable instrument to measure the outcomes of the programme, which had both: 1) been through a validation process portraying the psychometric properties of the instrument, and 2) was suitable to assess an IPE programme with a broad IPE profile. The choice of the SACS (Hinyard et al., 2019) was initially justified by the measure's sensitivity and openness towards both clinical and nonclinical interprofessional settings. The scale is considered context-free, in the sense that it does not favour specific professional activities or settings in its statements. Further, the initial validation of the SACS demonstrated high internal consistency and both convergent and discriminant validity as a measure of collaboration (Hinyard et al., 2019).

Still, the SACS is a relatively new instrument and there is a need to further validate the measure in different settings. In a study further evaluating the psychometric characteristics of the SACS Breitbach, Pole, Rauvola, Kettenbach, and Hinyard (2020) conclude that the instrument holds up as a valid tool in the new context, but also suggest that it may be a stronger tool for early IPE learners. They point to the need to validate instruments in multiple contexts (ibid.). The objective of this article is to contribute to the validation process of the SACS, by cross-validating the measure using data from Norwegian students attending INTERACT. The discussions in this article will be based on factor and regression

[3] At the time of the data collection of the current study.

[4] Act Relating to Children and Parents (the Children Act), 1981

analyses of the Norwegian dataset. The focus points for discussion will be on the stability of the SACS when applied in a new context, as well as on how variations in the students' scores on the SACS can be explained by background factors such as educational programme, age, and work experience. The latter is motivated by systematic reviews showing that learner characteristics such as gender, age, work experience and professional background may affect the delivery of IPE (Reeves et. al., 2016). An exploration of whether such background factors can explain the variance in student scores on the SACS may prove valuable to a discussion of the SACS' context- neutrality.

Methods

About the study

The current study is part of a mixed-methods evaluation project of INTERACT.

The initial validation of the SACS measure

The SACS measure is an 11-item scale consisting of three dimensions of collaboration: information sharing, learning, and team support (Hinyard et al., 2019). The 11 SACS items are scored on a 1–7 Likert-type scale, with answer categories pertaining from "strongly disagree" to "strongly agree". When developing the measure, Hinyard and colleagues (2019) first used exploratory factor analysis to assess its scale factor structure. This was done in a two-phase pilot study—comprising 160 and 131 students, respectively, in phases 1 and 2. Their samples consisted of students from several professions (pre-medicine, nursing, occupational therapy, physical therapy, nutrition/dietetics, medical laboratory sciences, biology, pre-physician's assistant, athletic training, radiation therapy, and "other"). In a later validation sample with 181 students, the researchers applied confirmatory factor analysis to confirm the factor structure found in the pilot study. Additionally, they assessed convergent and discriminant validity —comparing scores on the SACS with scores on the Morgeson et al.'s (2005) measure of contextual performance and the short-form CWB-C (ibid.). A thorough description of the measure, its psychometric properties, and its theoretical foundation is available in the original article. The initial validation of the SACS measure in these American student samples showed the scale to have satisfactory factor structure, reliability, and internal consistency—along with both convergent and discriminant validity as a measure of collaboration (Hinyard et al., 2019).

The SACS measure in a Norwegian setting

The SACS measure had prior to this study been applied only in English-speaking settings. Thus, several preparatory steps had to be taken to use it in a Norwegian context. First, ethical approval was provided by the Norwegian Centre for Research Data (NSD) and permission for usage in this context was obtained from the instrument developers. Translation into Norwegian was then performed, using forward-backward translation. The SACS measure was first translated into Norwegian by the project group, assisted by an

academic who was a native English speaker. The Norwegian version was then translated back into English, by a team consisting of a Norwegian medical professor who has been living in the U.S. and an American headmaster living in Norway. Finally, the two English versions, which showed only slight discrepancies, were compared, and discussed by the project group. This resulted in the final version of the measure in Norwegian.

The entire questionnaire was then piloted with a group of students at the Norwegian university. They filled in the questionnaire electronically and gave written feedback afterwards

Data collection

The data used in this article were collected in autumn 2019. All students (N=1096) enrolled in one of the modules of INTERACT (INTER 1200) received a digital questionnaire before participating in the module. Apart from including the SACS measure of interprofessional collaboration skills, the questionnaire contained questions around—for example—students' background characteristics, attitudes towards interprofessional collaboration and education, and knowledge about the everyday lives of children and youth. The questionnaire was made available on a digital learning platform for the INTER 1200 students, the evening before the module began. Since the first data point would function as a pre-survey, it was crucial that the students answered the survey at the beginning of the class. Those who had not yet filled it in when the module started were asked to spend the first 15 minutes of the class filling in the questionnaire, on the following morning. Participants completed the questionnaire anonymously.

Sample

Of the entire population of 1096 students attending INTER 1200 in autumn 2019 who were targeted for the survey, 538 students responded. Of these, 39 respondents were removed from the sample due to duplicates or due to the timing of their response, one outlier was also removed. The response rate ended up being 45.6 %. The distribution of students participating, from each of the seven educational programmes included in the study, can be found in Table 1.

Data analysis

Descriptive statistics

Descriptive statistics are presented in Tables 1, 2, and 3 below. Table 1 shows the total number of students enrolled in each of the seven educational programmes, and the numbers and percentages of students participating in the current study. The students' age and work experience are seen in Tables 2 and 3.

Table 1. The total number of students enrolled in the INTERACT programme, the number of students participating in the current study, and the percentage of students from the different educational programmes participating in the study.

Educational programme	Students in INTERACT, N=1096	Students in the study, N=499	Educational background by percentage
Nursing	144	63	12.6 %
Social work	103	58	11.6 %
Teacher education	341	169	33.9%
Physiotherapy	101	26	5.2%
Occupational therapy	54	21	4.2%
Child welfare services	83	40	8 %
Kindergarten teacher	270	122	24.4 %

Table 2. Age distribution of students participating in the study (N=499)

Age	*N*	*Percent*
21 years or younger	203	40.7
22–24 years	166	33.3
25–27 years	77	15.4
28 years or older	53	10.6

Table 3.[5] The percentage of students in the study with experience from, respectively: a) at least a two-week internship period during their studies; b) work experience relevant to the educational programme, current or present, and c) work experience related to children and youth

Background variables	*Yes*	*No*
Internship in the study	93.4 (n=466)	6.6 (n=33)
Relevant work experience	68.3 (n=341)	31.7 (n=158)
Work with children or youth	61.3 (n=306)	38.7 (n=193)

[5] In the table, missing data (N=2,0,1) is included in the most frequent category.

Data analysis strategies

Exploratory factor analysis

Exploratory factor analysis (EFA) was chosen as an analytical strategy to answer Research Question 1, about identifying the *original factor structure of the SACS*.

In the original validation of the SACS measure on the U.S. samples, the factor structure in the data was investigated using both EFA and confirmatory factor analysis (CFA). One of the current study's aims is to explore to what extent the reported factor structure can be replicated in the Norwegian sample. EFA is suitable when examining the structure of measures or constructs, where previous exploration of the structure is limited. Given the new context with Norwegian students, an explorative factor approach was chosen as the analytical strategy for this part of the study, with principal axis factoring (PAF) as the extraction method. PAF is one of the most commonly used extraction methods when carrying out factor analysis (Bandalos & Finney, 2010). Further, the oblique rotation strategy was chosen since theory suggests correlation between the factors. Costello & Osborne (2005, p. 7) emphasise that: *"Since oblique rotation will reproduce an orthogonal solution but not vice versa, we recommend oblique rotation".* Direct oblimin is the main form of oblique rotation (Cohen, Manion, & Morrison, 2018, p. 822), and was chosen for the rotation. Moreover, Tabachnick and Fidell (2014) suggest, as a rule of thumb, 0.32 as a minimum loading of an item for the item to be interpreted. The cut-off for size of loading to be interpreted in this study was set to ≥0.32.

The one negatively worded item in the scale was reverse rescored and missing data were set to item means.

Multiple regression analysis

A multiple regression analysis was applied to answer Research Question 2, regarding *to what extent the scores on the SACS measure vary with background factors such as educational programme, age, and work experience.*

The students' total scores on the SACS were used as the dependent variable. Regression analyses, where each of the three factors identified in the factor analysis were set as dependent variables, were also run. However, as there was no substantial change in the beta values with this solution, this article reports only the analysis with the students' total scores on the SACS as dependent variable. The background variables presented in Tables 1–3 were included as independent variables. The variable *"educational programme"* was recoded into three dummy variables (values 0 and 1). The sample was divided into three groups, based on the type of educational programme the students attend: health education (nursing, physiotherapy, occupational therapy, n=110); social care education (child welfare services, social work, n=98); and teacher education (kindergarten teacher, teacher education, n=291). This was to ensure that the sample size within each group was sufficiently large. All predictors were entered simultaneously in the analysis. This strategy

was chosen because no a priori reasons, either from statistics or theory, suggested otherwise (Field, 2018). The largest group, teacher education, became the reference group used in the model.

Results

Factor structure and reliability (N=499)

Factor structure:

An EFA using principal axis factoring with oblique rotation (direct oblimin) was conducted on the 11 items, using SPSS 27. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, KMO= 0.81. All KMO values for individual items were greater than 0.69. Bartlett's Test of Sphericity was statistically significant. Factor extractions should be guided by multiple approaches (Williams, Onsman, & Brown, 2010). Hence, an initial analysis was run to obtain eigenvalues for each factor in the data, as well as a scree plot. A scree plot is a visual presentation of the factors on a chart, presenting them in descending order of the magnitude of variance explained. The breaking point, where the scree plot flattens out, gives an indication of which variables account for a great amount of variance and which do not (Cohen et al., 2018). Three factors had eigenvalues over Kaiser's criterion of 1 and, in combination, they explained 60.87 % of the variance. The scree plot was unambiguous and confirmed the three-factor structure.

Table 4, below, shows the rotated factor loadings. The results confirm the three-factor structure of the SACS and, for most items, replicate the structure reported in the initial validation study of the measure. However, one item *("I consistently participate in team discussions with an open mind")* has small to moderate loadings on all three factors; and the highest loading is on a different dimension than expected, from the initial validation of the SACS. This finding will be discussed in more detail in the Discussion- section. Table 4 summarises the results of the EFA.

Table 4. Results of an explorative factor analysis on the SACS measure using SPSS, based on a Norwegian student population (N=499)

SACS Item	Factor loading		
	1	2	3
I voice my ideas about how the team could work better together (L).	**.68**	.13	.29
I encourage other team members to get involved in the decisions that affect the team (L).	**.61**	–.04	.30
I frequently seek feedback from my team members about the quality of my work (L).	**.58**	.02	–.08
I seek out different views than my own during team discussions (L).	**.53**	–.10	–.01
I routinely go out and get all the information I can from my teammates (L).	**.50**	–.11	–.17
I regularly acknowledge the efforts of my team members (TS).	–.00	**–.82**	.05
I routinely listen to the opinions of my fellow team members (TS).	–.09	**–.78**	.05
I consistently support the efforts of others (TS).	.09	**–.66**	–.07
I consistently participate in team discussions with an open mind (L).	.23	**–.36**	.22
It is hard for me to share my ideas with others (R) (IS).	–.07	–.01	**.71**
I share information with others easily (IS).	.12	–.17	**.50**
Eigenvalues	3.90	1.44	1.35
% variance	35.46	13.11	12.28
Cronbach's alpha	0.73	0.78	0.58
Correlations factor 1	1.00	–.44	.22
Correlations factor 2	–.44	1.00	–.23
Correlations factor 3	.22	–.23	1.00

Note. N = 499. Factor loadings above .32 are in bold. Reverse-scored items are denoted with an R. Dimensions (Learning, Team Support, Information Sharing) as reported in Hinyard and colleagues (2018) in brackets (L, TS, IS).

Reliability analyses

The Cronbach's alpha for the whole scale is 0.78. The reliability scores for both factors (dimensions) *"learning"* (α =0.73) and *"team support"* (α =0.78) are relatively high, especially considering the fairly low number of items included in the measure. The reliability score is somewhat lower for the third factor, "information sharing" (α =0.58). Yet this is not unnatural, considering that this dimension only consists of two items. The results of the EFA further show that factor 2, *"team support",* includes one item (I consistently participate in team discussions with an open mind) that loaded on the dimension "*learning"* in the initial validation study of the SACS (Hinyard et al., 2019). To examine the belonging of this item more thoroughly, additional reliability analyses were run. When this item was removed from factor 2, *"team support"*, Cronbach's alpha increases slightly to α= 0.79. Likewise, when including this item in the *"learning dimension"*, as in the original validation study, the Cronbach's alpha increases slightly for this factor to α = 0.75. This may support the structure of the SACS from the initial validation study. Moreover, if this item is deleted from the scale, the Cronbach's alpha for the whole scale decreases slightly to α = 0.76. This suggests that the item *"I consistently participate in team discussions with an open mind"* does contribute to explaining some of the overall variance of the scale. This will be further discussed in the Discussion- section.

Multiple regression analysis (N=499)

A multiple regression analysis was run to explore Research Question 2. The results presented include the R square (.010), ANOVA (p> .55), and the standardised beta coefficient of each component variable. The analysis shows that almost none of the variation in the dependent variable can be explained by the predictors. No statistically significant relationships between the students' scores on the total SACS measure and any of the included predictors (educational background, age, previous work experience [general], previous work experience [with children and youth], or internship) was found (F= .821).

Table 5. Results of a multiple regression analysis, testing the effect of students' background variables on their scores on the SACS measure.

Model	Unstandardised Coefficients		Standardised Coefficients		95.0% Confidence Interval for B	
	B	Std. Error	Beta	Sig.	Lower Bound	Upper Bound
(Constant)	5.568	.171		.000	5.231	5.904
Health education	.003	.077	.002	.966	−.147	.154
Social care education	.055	.072	.036	.446	−.086	.194
Age	−.003	.028	−.005	.910	−.058	.052
Internship period	−.049	.119	−.020	.679	−.282	.184
Relevant work experience (present or past)	−.089	.064	−.068	.162	−.214	.036
Work experience related to children and youth	−.055	.062	−.044	.379	−.176	.067

Note. R square= .010, all p's >.55

Discussion

Findings from the current study provide overall evidence for the claim that the SACS measure is a reliable instrument—one well-suited to measuring interprofessional collaboration skills, as defined in the instrument, across groups of students, within and beyond the health and social care sectors. The examination of the factor structure of the instrument, in a Norwegian dataset, confirmed the three-factor structure found in the original validation samples of students from the U.S. This study's findings further support the assumption that the SACS is context-neutral. The students' total scores on the SACS were neither significantly related to the type of educational programmes the students attended nor to background factors (like age, whether they had previous work experience with children and youth, etc.).

These results will be discussed in more detail below.

The psychometric properties of the measure

Overall, the EFA provided evidence supporting the psychometric soundness of the SACS measure when applied in a Norwegian context. The three-factor structure of the original SACS measure was confirmed, and the overall reliability was satisfactory. The results thus confirmed the consistency of the total scale. However, when looking at the subscales/dimensions separately, there are some discrepancies between the results of the initial validation of the SACS measure and the results of the EFA based on the scores from the Norwegian sample.

Firstly, two of the factors/dimensions, *"learning"* and *"team support"*, both had relatively high reliabilities (α= 0.73 / α= 0.78). However, the results for the third factor, *"information sharing"*, indicate a somewhat lower relationship between the items belonging to this factor (α = 0,58).

One explanation may be found in the battery itself. The SACS is short and easy to administer with only 11 items that might be divided into three dimensions. A consequence of this is, however, that the dimension *"information sharing"* only includes two items. The EFA literature suggests that *"at least three to five measured variables reflecting each common factor should be included, although even more is generally desirable"* (Fabrigar & Wegener, 2011). The relatively low reliability of the third dimension may also be a potential threat to the validity of this dimension. In the future, work might be done to strengthen this dimension.

Another result that should be further discussed is to which factor the item *"I consistently participate in team discussions with an open mind"* belongs. In the Norwegian sample, this item has small to moderate loadings on all factors, with the highest loadings on *"team support".* However, in the initial validation of the SACS measure, this item loads highest on the factor "*learning*". Further examination showed that Cronbach's alpha increased when the item was included in the *"learning"* dimension. It also showed that the reliability score increased for the *"team support"* dimension when the item was removed from this dimension. These statistically driven results may indicate that the item *"I consistently participate in team discussions with an open mind"* should belong to the *"learning"* factor, as originally intended.

Yet theories on interprofessional collaboration may suggest otherwise. Hinyard and colleagues (2019) note that the SACS was developed as a measure of collaboration that assesses a student's ability to contribute to and support fellow team members' performance, her/his ability to engage in productive conversations, and her/his ability to contribute to the learning of the team. One may, then, argue that the item in question*, "I consistently participate in team discussions with an open mind",* is theoretically a better fit within the *"team support"* dimension than the *"learning"* dimension. The introduction section highlights that interprofessional education concerns two or more professions that are learning with, from, and about each other (CAIPE) to create common knowledge (Edwards, 2012). Barr (2013) argues that learners in interprofessional settings thus need to be aware of their own professional knowledge, acknowledge the knowledge of others, be willing to engage in negotiations of meaning, and adjust actions accordingly (Barr, 2013). As Hean et al. (2012, p. 94) point out: *"Being able to give up a particular professional view of the patient/clients situation and take in the professional knowledge of others is at the heart of working interprofessionally".* Being open to the perspectives of others is an important part of this. Conceptually, then, the item "*I consistently participate in team discussions with an open mind"* can fit well with both dimensions. However, it is argued here that—when

scrutinising the item more closely—this item, content-wise, may be a better fit with the items relating to the dimension *"team-support"*, which focuses on contribution to and support of team member's performance, rather than with the items relating to the learning dimension. This said, it should be acknowledged that openness to the perspectives of others may also be an important prerequisite to learn with, from, and about others. Thus, both from a theoretical point of view and based on the results of this study, the belonging of the item *"I consistently participate in team discussions with an open mind"* can be further discussed. Nonetheless, the results of the reliability analysis did show that this item contributed to explaining some of the variance of the total scale and, thus, that it should be included in the SACS measure. Future research may provide better answers to the question of within which dimension this item fits best.

Finally, a note should be made that translation issues could also be the cause for the discrepancy between the results of the initial validation study of the SACS and this study, related to the issue of on which factor the item "*I consistently participate in team discussions with an open mind"* loads. A threat to validity in research across nations and cultures may, for example, be that the same items are interpreted differently by different groups (Cohen et al., 2018). In the case of applying the SACS in a Norwegian setting, "back-translation" was used as a technique to address this potential threat to validity. The questionnaire was also piloted in a group of students. However, there is still a risk that the item may be interpreted differently in the different samples, and that this could influence the students' answers.

Overall, though, the findings do support the reported factor structure of the SACS measure and confirm the reliability of the scale. The three dimensions of the SACS were retraced—although with some discrepancy, as discussed above. These results thus support findings from previous research (Hinyard et al., 2019) of the SACS as a measure of collaboration skills with sound psychometric properties.

Background factors' influence on variations in student scores on the SACS

The second research question in this study concerns how students' scores on the SACS vary according to background factors—such as which educational programme the students are attending, their age, etc. A major characteristic of the SACS measure is that it was developed to be implemented in both clinical and nonclinical interprofessional settings and is considered to be context-free (Hinyard et al., 2019). The SACS' context-neutrality was thus one of the rationales for its selection as an assessment tool in the INTERACT evaluation project. Yet work still needs to be done to strengthen this claim. The results of the regression analysis in this study, exploring how students' background factors influence variations in student scores, may contribute to this.

In the current study, students attending seven different educational programmes answered the SACS. The students were also asked to provide background information on their age; on

their previous work experience in general, and with children and youth more specifically; and on whether they had done an internship during their studies. The participants covered a satisfactory spectrum in terms of educational background, age, and work experience.

The results of the multiple regression analysis showed no statistically significant relationship between the students' scores on the SACS measure and any of the background variables. The non-significant results of the regression analysis thus show that, in the current study, background factors cannot explain the variation in SACS scores among the students. This finding supports an assumption that the SACS can be considered a context-neutral measure of collaboration skills.

These findings may prove valuable to professionals within higher education, who seek to evaluate IPE programmes with broad study profiles. Currently, there is an expressed need for IPE and IPC in various contexts. The point of departure for this article was a search for a validated instrument that could be used to assess learning in an IPE programme focusing on children and youth. The availability of validated and context-neutral instruments that are well-suited to measuring the outcomes of IPE programmes with a broad spectrum of profiles may become even more important in the future. The SACS may prove to be a useful contribution to meet such needs.

Strengths and limitations of the study

There are several strengths and limitations to this study, which should be taken into consideration. One potential limitation concerns the use of the SACS measure in a different context than that for which it was originally intended. The SACS was developed in the U.S. and initially validated in an English-speaking sample. Translation into another language can always be problematic. Here, this risk was attempted minimised by applying a back-translation technique when preparing the measure for the Norwegian context. Yet, language issues may be a limitation when validating instruments in other contexts than those for which they were originally intended. Possible response-bias is another limitation to this study. Approximately half of the entire student population invited to participate in this study (students attending INTER 1200) decided to participate. Potentially, this could affect the results. In the case of the current study this is not, however, judged to be a major threat. The survey did not contain sensitive topics and was answered anonymously. Thus, no obvious reasons why the students who chose not to participate in the study would answer differently than the respondents are identified. Another limitation to be considered is the lower reliability of the dimension *"information sharing"* than the other dimensions. Despite relatively high overall reliability, the reliability of this dimension was substantially lower than the rest. This could be further explored in future research. One practical solution to this, if it is considered central, may be to use the measure mainly as an overall scale and not use the subscales/ dimensions separately. Another solution is to add a small number of additional items to this subscale.

There are also several strengths to this study. One strength is its sample size. The sample is rather large (N=499), which is generally valuable when using statistical analyses. The sample size in the current study is also larger than the size of the samples used in the initial validation study, upon which the SACS measure is based. Still, corresponding results were found in the two validation studies—across cultures and languages. The sample size of this study thus utterly strengthens the results of the initial validation of the SACS. Another strength of the current study is the diversity among the participating students. They represent seven different educational programmes, covering programmes within health, social care, and education. There was a good spread among the participants in terms of age; previous work experience in general; and work experience related to children and youth, more specifically. This strengthens the findings related to the context-neutrality of the measure. It may also be a valuable point for evaluators seeking validated instruments to assess IPE outcomes within a broad field of study. The confirmation of the factor structure of the SACS, in a new cultural setting, strengthens the validity evidence of the measure and—consequently—also boosts the significance of the findings from the current study.

Conclusion

In modern welfare states such as Norway, effective collaboration among professionals—across various professional borders—is increasingly recognised as being essential to providing high-quality services to users. Key government policy documents, for example, conclude that it is necessary to increase collaboration among professionals involved in the lives of children and youth to meet their needs growing up (Gulbrandsen, 2014). Yet despite the increased attention focused on interprofessional collaboration across established borders—and, consequently, also the development of corresponding IPE programmes—there is still a shortage of validated instruments that are well-suited to assess the outcomes of such programmes. It is vital that the higher education professionals evaluating such programmes have access to validated instruments that can capture essential aspects of IPE, such as collaboration, and that are not hampered by such obstacles as professional jargon connected to specific disciplines. Moreover, it is also pertinent that the instruments' theoretical frameworks are reported by the developers of the instruments. This article has aimed to help fill this gap, by cross validating the SACS measure within a group of Norwegian students. The study's findings provide support to the validity claims put forward in the initial validation process of the SACS, where it was found to be a measure of collaboration skills that shows high internal consistency and can be applied in various IPE settings. Overall, the results of the EFA on the Norwegian data support the factor structure of the SACS measure and indicate that it is quite stable across the different settings. The three dimensions of collaboration in the SACS (information sharing, learning and team support) were retraced, though with a slight exception for one of the items. The results of the multiple regression analysis—which explored how student scores on the SACS might vary according to the students' background variables—revealed no such statistically

significant relationship. This finding provides a contribution to the claim that the SACS is context neutral.

Conclusively, this study supports previous research (Hinyard et al., 2019) presenting the SACS as a validated measure of collaboration skills that can be applied in various IPE settings. This may prove to be valuable, in turn, to higher education professionals who seek to assess the IPE outcomes of IPE programmes with non-traditional profiles. The SACS is short and easy to administer. It has also been proven to have promising psychometric properties when applied in the Norwegian setting. Thus—while additional research could still be carried out, both to explore the three dimensions of the SACS more thoroughly and to explore the SACS' suitability for advanced learners (Breitbach et al., 2020)—the SACS has shown promising results as a context-neutral measure of collaboration skills in IPE programmes.

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