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ORIGINAL ARTICLE

The development and psychometric evaluation of an interprofessional identity measure: Extended Professional Identity Scale (EPIS)

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ABSTRACT

The purpose of this study was to develop and evaluate an interprofessional identity measurement instrument based on Extended Professional Identity Theory (EPIT). The latter states that interprofessional identity is a social identity superordinate to a professional identity consisting of three interrelated interprofessional identity characteristics: belonging, commitment and beliefs. Scale development was based on five stages: 1) construct clarification, 2) item pool generation, 3) review of initial item pool, 4) shortening scale length (EFA to determine top four highest factor loadings per subscale; 97 dental and dental hygiene students), and 5) cross-validation and construct validity confirmation (CFA; 152 students and 48 teachers from six curricula). Explained variance of the EPIS was 65%. Internal consistency of the subscales was 0.79, 0.81 and 0.80 respectively and 0.89 of the overall scale. CFA confirmed three-dimensionality as theorized by EPIT. Several goodness-of-fit indexes showed positive results: CFI = 0.968 > 0.90, RMSEA = 0.039 < 0.05, and SRMR = 0.056 ≤ 0.08. The factor loadings of the CFA ranged from 0.58 to 0.80 and factors were interrelated. The Extended Professional Identity Scale (EPIS) is a 12-item measurement instrument with high explained variance, high internal consistency and high construct validity with strong evidence for three-dimensionality.

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Interprofessional identity; Extended Professional Identity Theory; Extended Professional Identity Scale; interprofessional collaboration; measurement; scale development

Introduction

Identity is considered an important influence on interprofessional collaboration (e.g. Khalili, Orchard, Spence Laschinger, & Farah, 2013; Langendyk, Hegazi, Cowin, Johnson, & Wilson, 2015; Stull & Blue, 2016). Interprofessional collaboration can be obstructed when it is perceived as a threat to one's professional identity (e.g. Baker, Egan-Lee, Martimianakis, & Reeves, 2011; Cameron, 2011; Green & Johnson, 2015; Lloyd, Schneider, Scales, Bailey, & Jones, 2011; Mitchell, Parker, & Giles, 2011). However, social identification processes can also unite individuals through the psychological association with a similar or shared social category (James, 2015). Therefore, facilitating interprofessional identity formation is likely to enhance interprofessional collaboration.

Measuring interprofessional identity strongly depends on the theory it is based on. Good scales are based on sound theory. The usefulness of any scientific theory is determined by its falsifiable ability to predict a complex phenomenon adequately (Popper, 1963). According to the Extended Professional Identity Theory (EPIT; Reinders, 2018; Reinders et al., 2018a) an interprofessional identity is a social identity based on a widening circle of group membership that consists of more than one profession. EPIT states that interprofessional identity a superordinate social identity of professional identity with three interrelated characteristics: interprofessional belonging, interprofessional commitment and interprofessional beliefs. Professional diversity is a characteristic of interprofessional teams and partnerships, and a distinct professional identity is therefore inherent to an interprofessional identity. The distinction between these two complementary social identities also becomes visible in the Meta-Model of Interprofessional Development (Reinders, 2018; Reinders, Pesut, Brocklehurst, Paans, & van der Schans, 2018b). This meta-model describes how professional identity formation is conditional to interprofessional identity formation and what is needed to facilitate interprofessional team performance on operational and strategic levels. This interprofessional performance is expressed in the client- or patient-centered integration of different professional services to enable a joint outcome (Headrick, Wilcock, & Batalden, 1998; Reinders et al., 2018b). Some studies provide evidence that identification can improve the relationship between team diversity and team performance (Liao, O'Brien, Jimmieson, & Restubog, 2015; Mitchell et al., 2011; Tropp & Wright, 2001). However, these studies measured team identity or ingroup identification and not interprofessional identity. Currently, measurement instruments only measure one or related characteristics but not all of the three identity characteristics of interprofessional identity as a superordinate social identity of the subordinate professional identity.

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Background

Measuring interprofessional identity has several gains. An instrument that can measure interprofessional collaboration would be a useful tool for scientific, practical and educational purposes. There is a great need to evaluate the effectiveness of interprofessional education on changing and improving cognitions, affects and behaviors (Barr, Freeth, Hammick, Koppel, & Reeves, 2005; Reeves et al., 2016). In turn, the evidence of the effects of interprofessional cognitions, affects and behaviors on health practice outcomes is limited (Reeves, Pelone, Harrison, Goldman, & Zwarenstein, 2017; Reeves, Perrier, Goldman, Freeth, & Zwarenstein, 2013). For these main reasons, this new measurement instrument is potentially useful in several ways. First, to predict behavior that corresponds with identity (e.g. Ashfort & Kreiner, 1999; Hogg, van Knippenberg, & Rast, 2012; Kelly, 1993; Owens, Robinson, & Smith-Lovin, 2010; Savickas, 2011). Second, to select personnel or student candidates to determine the optimal fit between individual and team, organization or educational institute if one has more candidates than positions (Chamorro-Premuzic & Furnham, 2010; Patterson et al., 2016, 2016). Third, to be able to distinguish interprofessional identity from other factors when investigating antecedents of successful joint outcomes. Fourth, to investigate the effectiveness of interventions in practice and education (Reinders et al., 2018a). Fifth, to investigate socialization factors associated with identity formation and interprofessional collaboration (Cruess, Cruess, Boudreau, Snell, & Steinert, 2015). Finally, to use it as a learning tool for individual interprofessional self-reflection (Clark, 2009).

According to EPIT (Reinders, 2018; Reinders et al., 2018a) an interprofessional identity is a social identity, and it should also consist of social identity characteristics. However, the three characteristics (interprofessional belonging, interprofessional commitment and interprofessional beliefs) as described by EPIT, are not concepts which are measured by any current instrument. Several instruments measure one or related characteristics but not all three. For instance, the Dual Identity Scale (DIS; Khalili, 2013) consists of 30 items divided into four subscales: interprofessional belonging, professional belonging, dual identity achievement and cross disciplinary attitudes. Interprofessional belonging is explicitly measured by the DIS but not the two other characteristics. With regard to interprofessional commitment, no measurement can be found even though commitment is considered an important predictor of work behavior when investigating professional identity (Lee, Carswell, & Allen, 2000). In addition, group commitment is associated with ingroup identification (Ellemers, Spears, & Doosje, 1997) which is in line with EPIT (Reinders, 2018; Reinders et al., 2018a). Commitment emerges from positive experiences associated with attitudinal processes of development (Brown, 1996). With regard to interprofessional beliefs, a larger number of scales qualifies to measure this. However, it is important to make a distinction between the constructs 'attitude' and 'beliefs' since many items only apply to attitudes. A belief refers to the probability of the existence of an entity while attitude is the evaluation of an entity (Fishbein & Raven, 1962).

An example of a scale that also measures beliefs is the Interprofessional Socialization and Valuing Scale (ISVS; King, Orchard, Khalili, & Avery, 2016). Socialization processes are important for identity formation (Blue, Phillips, Born, & Lopez, 2011; Brim, 1968; Cruess et al., 2015). The ISVS consists of 31 items divided into three subscales but only two subscales are related to beliefs: ability in working with others and value in working with others. The Assessment of Interprofessional Team Collaboration Scale (Orchard, King, Khalili, & Bezzina, 2012) also consists of some belief related items regarding the degree of interprofessional collaboration. This is a 37-item scale which is subdivided into three subscales: partnership/shared decision making, cooperation and coordination. Another example of a well-known scale is the Readiness for Interprofessional Learning Scale (RIPLS). This scale is especially focused on attitudes and is often used in interprofessional research (Parsell & Bligh, 1999). Even though the RIPLS is translated into different languages and applied worldwide (Mahler et al., 2016), it is also a problematic scale (Kerry, Wang, & Bai, 2018; Mahler, Berger, & Reeves, 2015). Especially the subscales negative and positive identity suffer from low reliability and evidence of its validity is weak (Mahler et al., 2015). For these reasons it has been recommended to refine the RIPLS (Kerry et al., 2018) or not to use the RIPLS at all (Mahler et al., 2015; Schmitz & Brandt, 2015). So far, no measurement instrument exists that measures interprofessionaal identity as superordinate to a subordinate professional identity and which consists of three interrelated social identity characteristics: interprofessional belonging, interprofessional commitment and interprofessional beliefs.

The purpose of this study was to develop and evaluate an interprofessional identity instrument that measures interprofessional belonging, interprofessional commitment and interprofessional beliefs: Extended Professional Identity Scale (EPIS).

Method

Sample

For each developmental stage in the development of the EPIS, we involved different groups of people. Two assessors were involved in collection, adaption and revision of items for three initial item pools, one per identity characteristic. For the next stage (item selection based on face validity), we involved five practitioners from different disciplines in healthcare and welfare: a physician, a nurse, a dietitian, a dental hygienist, and a social worker. Next, respondents were approached for two independent samples of two consecutive quantitative studies. In the study of the first independent sample of respondents, 120 dental and dental hygiene students were asked to complete a questionnaire. All these students had no prior experience with IPE, but did attend the introductory lecture of an IPE program. In the study of the second independent sample we asked 152 students and 48 teachers from six different curricula (dentistry, dental hygiene, physiotherapy, dietetics, speech therapy, and medical imaging & radiation oncology) to participate.

Research procedure

The study design was based on methods of scale development research (Worthington & Whittaker, 2006). Our developmental procedure consisted of five consecutive stages: 1) construct clarification, 2) item pool generation, 3) review of initial item pool, 4) scale shortening and 5) cross-validation (Figure 1).

Stage 1 concerned the clarification of interprofessional identity as a construct. For this purpose the Extended Professional Identity Theory (Reinders, 2018; Reinders et al., 2018a) was used. Indirect evidence for the viability of this psychological theory is available (Reinders, Krijnen, Stegenga, & van der Schans, 2017) but direct evidence was still lacking: confirmation of three-dimensionality and interrelatedness of interprofessional identity characteristics. The construct of "interprofessional identity" as described by this theory provided clues for item selection and subscale construction.

Stage 2 consisted of collecting, adapting and revising a large and arbitrary number of items to create three initial item pools, one per subscale. A literature exploration was conducted to identify measurement instruments with items that are directly or indirectly related to interprofessional, belonging, commitment and/or beliefs. The eight items of the subscale 'Interprofessional belonging' of the Dual Identity Scale (Khalili, 2013) were selected as validation items. These items are rated on a 5-point Likert scale. Besides these eight validation items, two assessors (one IPE lecturer, a work and organizational psychologist, and one student with IPE-experience, a dental student) gathered and constructed an arbitrary number of items divided into three subscales. For the purpose of feasibility and practical applicability we predetermined a limited number of items for the final scale and subscales. We wanted to reduce scale length because this can account for increased respondent burden and decreased response rates (Cone, Viswesh, Gupta, & Unni, 2018; Cunningham, Ansara, Wild, Toneatto, & Koski-Jännes, 1999; Jepson, Asch, Hershey, & Ubel, 2005). Therefore, our goal was to develop a short measurement instrument no longer than twelve items. This is an arbitrary number based on the guidelines of Soto and John (2018). Furthermore, each factor should be represented by at least three to five items (MacCallum, Widaman, Zhang, & Hong, 1999; Raubenheimer, 2004). In order to enable selection of items most strongly related to their attributed subscale, we preselected more items than the desired final version of four items per subscale (Figure 2).

Stage 3 concerned the review of the three initial item pools preselected in Stage 2 (Figures 1 and 2). This review concerned an item selection based on face validity by five independent reviewers (practitioners, not teachers) who are experienced members of five distinct professions (physician, nurse, dietitian, dental hygienist and social worker). These reviewers were asked individually to attribute 35 preselected items to three specific social identity characteristics: interprofessional belonging, interprofessional commitment and interprofessional beliefs. Thereafter, to rank these attributed items based on the degree of their perceived relevance to the attributed identity characteristic. Next, items were selected by determining the eight items per subscale with the highest agreement among the five independent professionals. Prior to this item selection, each member was instructed about the difference between multi- and interprofessional collaboration.

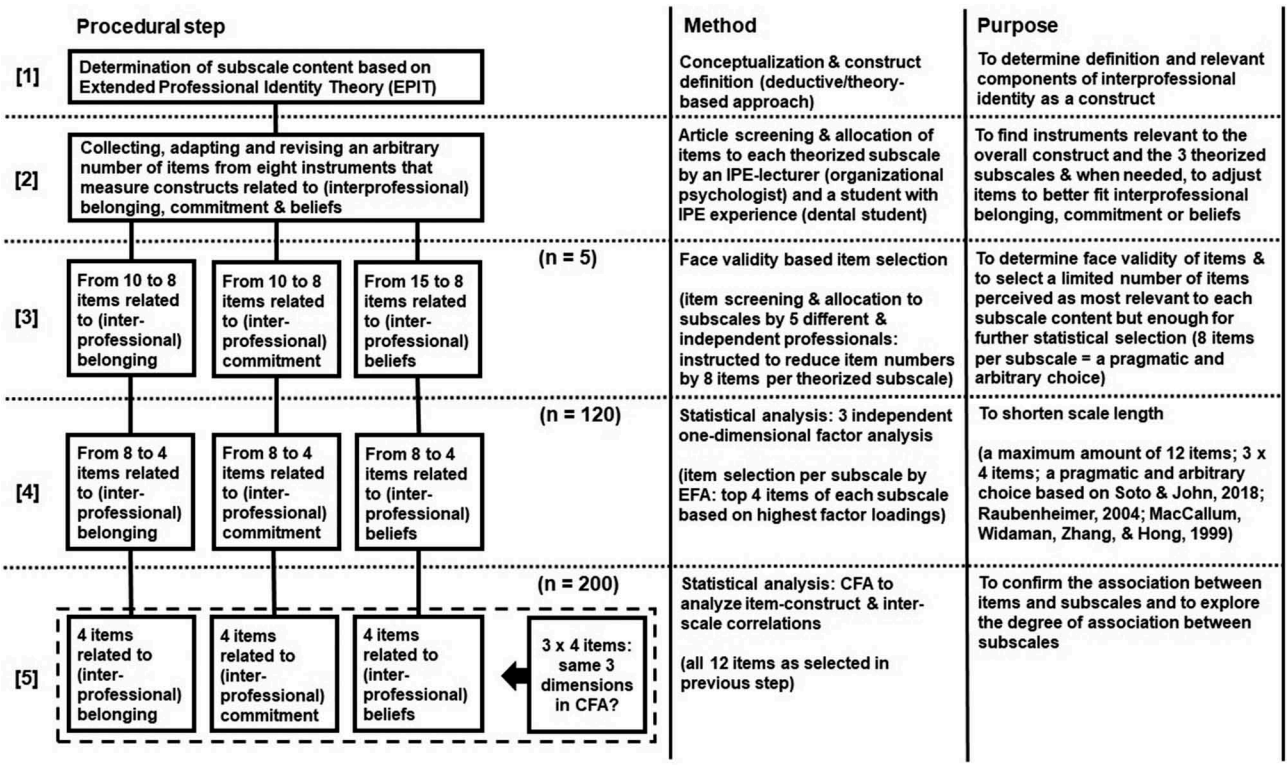

Figure 1. Study design describing five developmental stages of the Extended Professional Identity Scale (EPIS) based on scale development research (Worthington & Whittaker, 2006).

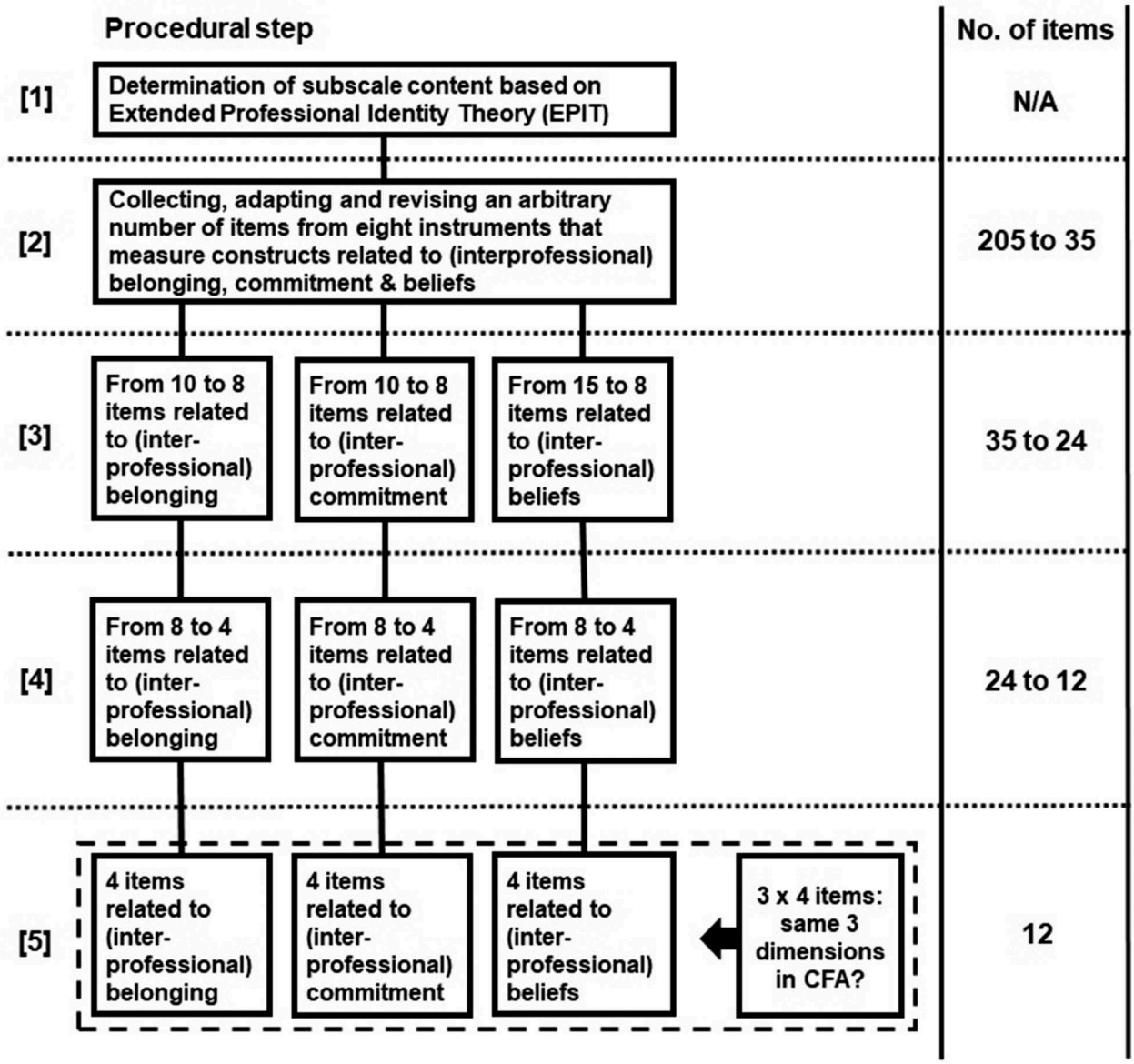

Figure 2. Flowchart of item selection and scale analysis with a predetermined number of 12 items for the final version of the Extended Professional Identity Scale (EPIS).

In addition, they were informed about the conceptualization of interprofessional identity in concordance with EPIT (Reinders, 2018; Reinders et al., 2018a).

Stage 4 consisted of administering the 24 items (8 items for each subscale) to dental and dental hygiene students. Responses were measured on the same response format as the validation items: a five-point Likert response format (1 = strongly disagree, 2 = disagree, 3 = neutral, 4 = agree, 5 = strongly agree). The purpose of this stage was to shorten the length of the scale to 12 items (4 items per subscale). This was accomplished by conducting a separate exploratory factor analysis (EFA) per subscale. The top four highest ranking items per subscale were selected based on the highest factor loadings (Figure 2).

Stage 5 concerned an independent sample of teachers and students from different disciplines to investigate the 12-item EPIS as statistically selected and evaluated in the previous stage. The purpose of this stage was cross-validation and confirmation of construct validity as theorized by the EPIT. Data were collected with a digital survey tool such that questionnaires could only be send to an external database when fully completed.

Data analysis

The item selection per subscale to shorten the overall scale, was performed by EFA. After this item selection, we performed an EFA on all items. Explained variance was considered high when ≥ 60% (Hair, Black, Babin, & Anderson, 2010). In order to test the construct validity of the EPIS and because a deductive theory-based approached to scale development was used, a confirmatory factor analysis (CFA) was carried out on an independent sample (n = 200). Because the chi-square test is sensitive for sample size, additional goodness-of-fit indexes were also calculated: CFI, RMSEA, and SRMR. We used the following cutoff values to interpret each

index: CFI (Comparative Fit Index) > 0.90 is considered good (Hu & Bentler, 1999), RMSEA (Root Mean Square Error of Approximation) is considered a good fit with values < 0.05 and an adequate fit < 0.08 (MacCallum, Browne, & Sugawara, 1996), and SRMR ≤ 0.08 (Hu & Bentler, 1999). Polychoric and polyserial inter-item correlations were considered strong when > 0.50; Cohen, 1988). For the second sample, internal consistency of the subscales and overall scale were analyzed using a Cronbach's alpha. Values of this reliability index are considered sufficient when > 0.70 (Nunnally, 1978; Nunnally & Bernstein, 1994). Finally, additional psychometric analyzes were performed by non-parametric kernel smoothing IRT with polychoric correlations between the ordinal items. To analyze monotonicity, we added figures to visualize the relationship between expected item scores and expected scores of the overall scale. That is, the latter analysis was used to explore whether and how increasing item scores are associated with larger latent trait scores.

Ethical considerations

Participants were informed about the nature of this study, were invited to participate in this study on a voluntary basis and their anonymity was guaranteed.

Results

Stage 1: subscale content based on Extended Professional Identity Theory (EPIT)

According to EPIT an interprofessional identity is a superordinate social identity and, thus, a widening circle of group membership which includes any professional identity (Figure 3). Therefore, it has three interrelated interprofessional social identity characteristics:

Figure 3. Interprofessional identity as a superordinate social identity of professional identity with three interrelated characteristics.

Stage 2: collecting, adapting and revising items for three initial data pools

The exploratory literature search and predetermined validation items of the Dual Identity Scale (Khalili, 2013) resulted in a collection of eight measurement instruments with a total of 205 items by two independent assessors (Figure 2). Of these items, 35 items were preselected for three initial item pools, one item pool for each identity characteristic (subscale). This number of items also included the eight validation items (Khalili, 2013) and two additional items based on the EPIT. Of the 35 items, 10 items were preselected for the subscale item pool "interprofessional belonging", 10 items for the subscale item pool "interprofessional commitment", and 15 items for the subscale item pool "interprofessional beliefs" (Table 1).

Some items were adapted or revised to make their formulation shorter or to apply them to interprofessional identity rather than organizational or professional identity. In addition, some existing items were presented as attitudes rather than beliefs and adapted into social normative rather than evaluative statements. With regard to commitment, only items related to affective commitment were selected since only this type of commitment is related to identification (Allen & Meyer, 1996, 1990; Lam & Liu, 2014). Affective commitment concerns the relative strength of an individual's identification and involvement (Mowday, Steers, & Porter, 1979).

Stage 3: items selected by five independent reviewers based on face validity

Of 35 preselected items divided over three subscales, a predetermined number of 24 items were divided and attributed to the three separate item pools (8 items per pool) representing interprofessional belonging (8 items), interprofessional commitment (8 items) or interprofessional beliefs (8 items) based on perceived relevance (Table 2). Especially the validation items from Interprofessional Belonging (subscale of DIS; Khalili, 2013) were proportionally strongly represented in these results (six of the eight original items). The two non-selected items were recode-items and concerned not wanting to make friends with members of other health professions and ``having the feeling it would be better when different health care professionals would work independently".

Stage 4: shortening scale length

During this stage 24 items were administered to a development sample. Of all 120 dental and dental hygiene IPE participants, 80.8% (97 students) volunteered to complete a questionnaire at the beginning of their IPE program. The group respondents consisted of 47 dental students, 47 dental hygiene students, and 3 students who did not report their discipline. About 70% of all dental students were female (n = 33) and more than 96% (n = 45) of all dental hygiene students. The average age of the dental students was 21.8 years old (SD = 1.4 years) compared to an average age of 21.0 years old (SD = 3.8 years) among dental hygiene students (t = 1.416, df = 92, n.s.). Four items per identity

Table 1. Preselection based on consensus between two independent assessors (an IPE-lecturer and organizational psychologist and a dental student with IPE experience) of 35 items attributed to belonging, commitment and beliefs; sometimes adapted to the interprofessional context.

Measurement instrument	Source	Subscales	Number of items	Preselected items based on EPIT construct **
Dual Identity Scale (DIS)	Khalili, 2013	Interprofessional belonging (IPB)*	8	Belonging: 8
		Professional Belonging (PB)	10	N/A
		Dual Identity Achievement (DIA)	8	Commitment: 3
		Cross Disciplinary Attitudes (CDA)	4	N/A
University of the West of England (UWE) Interprofessional Questionnaire	Pollard, Miers, & Gilchrist, 2005	Communication an Teamwork Scale	9	N/A
		Interprofessional Learning Scale	9	N/A
		Interprofessional Interaction Scale	9	Beliefs: 2 items
		Interprofessional Relationships Scale	8	Belonging:1 item Beliefs: 1 item
Three-component Organizational Commitment Scale (OCS)	Allen & Meyer, 1990	Affective commitment	8	Commitment: 5 items
		Continuance commitment	8	N/A
		Normative commitment	8	N/A
Interprofessional Socialization and Valuing Scale (ISVS)	King et al., 2016	Comfort in working with others	9	N/A
		Ability to work with others	11	Beliefs: 2
		Value in working with others	14	Beliefs: 1
Readiness for interprofessional learning scale (RIPLS)	Parsell & Bligh, 1999	Team-work and collaboration	9	Beliefs: 3 items
		Professional identity	7	N/A
		Roles and responsibilities	3	N/A
Assessment of Interprofessional Team Collaboration Scale (AITCS)	Orchard et al., 2012	Cooperation	11	N/A
		Partnership	19	Belief: 5 items
		Coordination	7	N/A
Organizational Commitment Questionnaire (OCQ)	Mowday et al., 1979		15	Commitment: 1 item
Organizational commitment	Blau, 1985		9	Commitment: 1 item
Newly constructed items based on EPIT**	Reinders et al., 2018a		2	Belonging: 1 item Beliefs: 1 item
			205	35

*Validation items; **Extended Professional Identity Theory (Reinders, 2018; Reinders et al., 2018a); N/A = not applicable

characteristic selected with EFA were provided by six different measurements instruments (Table 2). Factor loadings per subscale varied between 0.715 and 0.956, well above the norm 0.40 as suggested by Stevens (2002).

Stage 5: cross-validation and confirmation of construct validity

All participants who were approached to complete a 12-item EPIS, wanted to contribute and complete this. Of the 152 students, 54 were physiotherapy students, 36 dental hygiene students, 36 dental students, 16 speech therapy students and 10 dietetics students. The age of the students form this sample was not registered but all students were all halfway through their own study program. The majority of students was female (75.3%; n = 113; missing data: 3). Of all teachers, 12 were speech therapy teachers, 10 physiotherapy teachers, 8 medical imaging & radiation oncology teachers, 7 dental hygiene teachers, 7 dietetics teachers, and 4 other professions otherwise specified. The average age of teachers was 42.3 years old (SD = 9.2 years). The majority of teachers was female (70.8%; n = 34) with exception of the equal gender distribution among Medical Imaging & Radiation Oncology teachers.

The internal consistency of the overall scale of the 12-item EPIS was 0.89. The internal consistency of interprofessional belonging, interprofessional commitment and interprofessional beliefs was 0.79, 0.81 and 0.80 respectively. Thus, internal consistency was above the norm of 0.70 in all cases (Nunnally, 1978; Nunnally & Bernstein, 1994). The overall measure explained 65.0% of the variance and, thus, above the norm of 60% (Hair et al., 2010).

Polychoric correlations among items of interprofessional belonging showed moderate ($r \geq 0.37$) to strong correlations ($r = 0.63$) with the latent trait according to Cohen's (1988) conventions (Table 3). The same applied to interprofessional commitment ($r \geq 0.48$ up to and including $r = 0.67$) and interprofessional beliefs ($r \geq 0.38$ up to and including $r = 0.65$). Polyserial correlations of interprofessional belonging, interprofessional commitment and interprofessional beliefs all showed strong associations ($r \geq 0.66$ up to and including $r = 0.82$).

Figure 4 shows IRT plots of expected item scores related to expected scores of interprofessional belonging items. Plots show a strong monotonicity and nearly linear relationships. Especially the plots of items 3 and 4 show relatively straight lines.

Figure 5 shows IRT plots of expected item scores related to expected scores of interprofessional commitment items. Plots

Table 2. Shortening scale length by using EFA on 24 items (n = 97) as selected beforehand by five professionals (physician, nurse, dietitian, dental hygienist, and social worker) based on relevance (face validity) to three subscales.

Sub-scale	Item	Existing, adopted or new item	Source	Factor loadings	Top 4
Interprofessional belonging	1. I like meeting and getting to know people from other health professions.	Existing	Dual Identity Scale (Khalili, 2013)	**.862**	2
	2. I feel a strong attachment toward interprofessional teams comprising cross-disciplinary health professionals.	Existing		**.814**	3
	3. I enjoy learning and collaborating with people from other health professions.	Existing		**.891**	1
	4. I often feel it would be better if different health professionals work together as a team.	Existing		.666	
	5. I like learning about other health professions.	Adapted		**.760**	4
	6. I am a health care professional who collaborates with other disciplines.	New	Constructed by the authors	.755	
	7. I feel that I am respected by people from other health and social care disciplines.	Existing	UWE Interprofessional Questionnaire (Pollard et al., 2005)	.360	
	8. I have a strong sense of belonging toward interprofessional teams comprising cross-disciplinary health professionals.	Existing	Dual Identity Scale (Khalili, 2013)	.724	
Interprofessional commitment	1. I would be very happy to spend the rest of my career with an interprofessional team.	Adapted	Organizational Commitment Scale (OCS; Allen & Meyer, 1990)	**.956**	1
	2. I identify myself with other members of an interprofessional team.	Adapted	Organizational Commitment Scale (OCQ; Mowday et al., 1979)	**.785**	3
	3. I am proud to be a part of an interprofessional team.	Adapted	Organizational commitment (OC; Blau, 1985)	**.779**	4
	4. I prefer working with others in an interprofessional team.	Adapted	ISVS (King et al., 2016)	**.920**	2
	5. I feel able to act as a fully collaborative member of an interprofessional team.	Adapted		.625	
	6. I often think about how my life will be affected by my interprofessional team membership.	Adapted	Dual Identity Scale (Khalili, 2013)	.652	
	7. I have a clear sense of interprofessional collaboration and what it means for me.	Existing		.412	
	8. I consider problems of an interprofessional team as my own problems.	Adapted	Organizational Commitment Scale (OCQ; Allen & Meyer, 1990)	.729	
Interprofessional beliefs	1. All members of an interprofessional team should be involved in goal setting for each patient.	Adapted	AITCS (Orchard et al., 2012)	**.882**	2
	2. When care decisions are made, the interprofessional team members should strive for consensus on planned processes	Adapted		**.715**	4
	3. Interprofessional team members should jointly agree to communicate plans for patient care.	Adapted		**.921**	1
	4. Joint clinical decision-making should be an important part of interprofessional collaboration.	Adapted	ISVS (King et al., 2016)	**.815**	3
	5. My profession should be a part of an interprofessional team.	New	Constructed by the authors	.645	
	6. Team-working skills are essential for all health care professionals to learn.	Adapted	RIPLS (Parsell & Bligh, 1999)	.535	
	7. Patients would ultimately benefit if health care professionals work together	Adapted		.620	
	8. All members of health and social care professions have equal respect for each discipline.	Existing	UWE Interprofessional Questionnaire (Pollard et al., 2005)	.440	

Table 3. Polychoric and polyserial inter item correlations for each of the three subscales of the 12-item Extended Professional Identity Scale (EPIS; n = 200).

	Polychoric correlations				Polyserial
Item	1.	2.	3.	4.	correlations
1. Belonging (meeting people)	-				0.74
2. Belonging (strong attachment)	0.37	-			0.66
3. Belonging (enjoy collaborating)	0.44	0.38	-		0.81
4. Belonging (learning about)	0.59	0.40	0.44	-	0.70
1. Commitment (spend rest of career)	-				0.82
2. Commitment (identify with team)	0.49	-			0.77
3. Commitment (proud to be part)	0.67	0.51	-		0.76
4. Commitment (prefer working with)	0.49	0.50	0.48	-	0.82
1. Beliefs (involved in goal setting)	-				0.79
2. Beliefs (consensus planned processes)	0.49	-			0.76
3. Beliefs (communicate plans)	0.65	0.42	-		0.78
4. Beliefs (joint decision-making)	0.50	0.46	0.61	-	0.71

show a strong monotonicity and nearly linear relationships. All plots show relatively straight lines.

Figure 6 shows IRT plots of expected item scores related to expected scores of interprofessional beliefs items. Plots show a strong monotonicity and nearly linear relationships. Especially the plots of items 1 and 4 show relatively straight lines.

A CFA was conducted to confirm the relationships between the items and subscales and the latent variable. Figure 7 shows the confirmatory three-factor model of the Extended Professional Identity Scale (EPIS) with standardized path coefficients. Strong factor loadings were found between items and their identity characteristic. The correlations between the factors (0.69, 0.70 and 0.80) were strong (> 0.50; Cohen, 1988). With the exception of the model Chi-square ($\chi 2$ = 66.454,

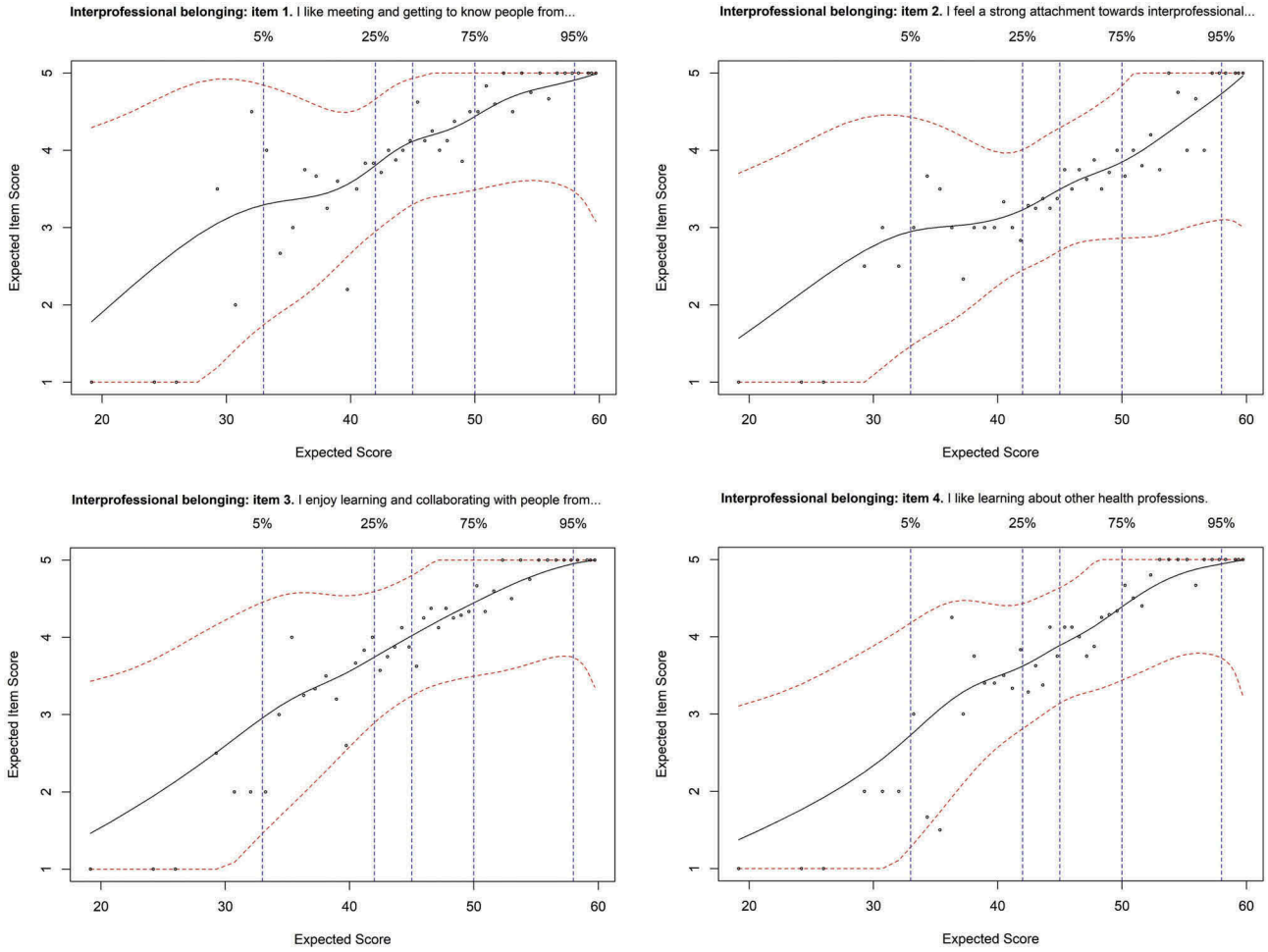

Figure 4. IRT plots of expected item scores related to expected scores of interprofessional belonging items (n = 200).

df = 51, p = .072), each of the goodness-of-fit indexes of the three-factor model showed positive outcomes: the CFI (= 0.968 > 0.90), the RMSEA (= 0.039 < 0.05), and the SRMR (= 0.056 ≤ 0.08) all fit well. Consequently, the three-factor model was finally accepted.

Discussion

The purpose of this study was to develop and to evaluate a new interprofessional identity measurement instrument that measures a social identity based upon interprofessional belonging, interprofessional commitment and interprofessional beliefs. A short interprofessional identity measurement instrument was developed with high explained variance, high internal consistency, high construct validity and evidence for three-dimensionality: Extended Professional Identity Scale (EPIS).

Results lend weight to the assumptions of the Extended Professional Identity Theory (Reinders, 2018; Reinders et al., 2018a). As predicted by EPIT, interprofessional identity concerns a larger group or social category that includes more than one profession. All items selected were strongly related to the same general construct of interprofessional identity. The magnitude of the associations of all individual items with the construct of interest, interprofessional identity, were good to excellent (Comrey & Lee, 1992). Our study in stage 5 provided support for three-dimensionality and the theorized interrelatedness of these dimensions. In addition, polychoric and polyserial inter item correlations for each of the three subscales were moderate to strong (Cohen, 1988; Poon & Lee, 1987).

The newly developed EPIS has become a short scale of 12 items since each additional item entails costs in terms of increased administration time and respondent fatigue (Burisch, 1984). However, this might be considered too small to measure a psychological construct like interprofessional identity. Yet, as the length of a scale increases, every additional item will proportionally provide a smaller contribution to measurement precision (Soto & John, 2018). When considering both validity as well as respondent fatigueness, scale length should not be less than six items and the validity gained per extra item is likely to be negligible when scale length is more than twelve items according to research of Soto and John (2018). Moreover, four items per subscale is an adequate number to obtain sufficient internal consistency (Hinkin & Schriesheim, 1989) and each factor should be represented by three to five items (MacCallum et al., 1999; Raubenheimer, 2004).

The internal consistency of subscales and overall scale varied. However, Cronbach's alpha found were all well above the

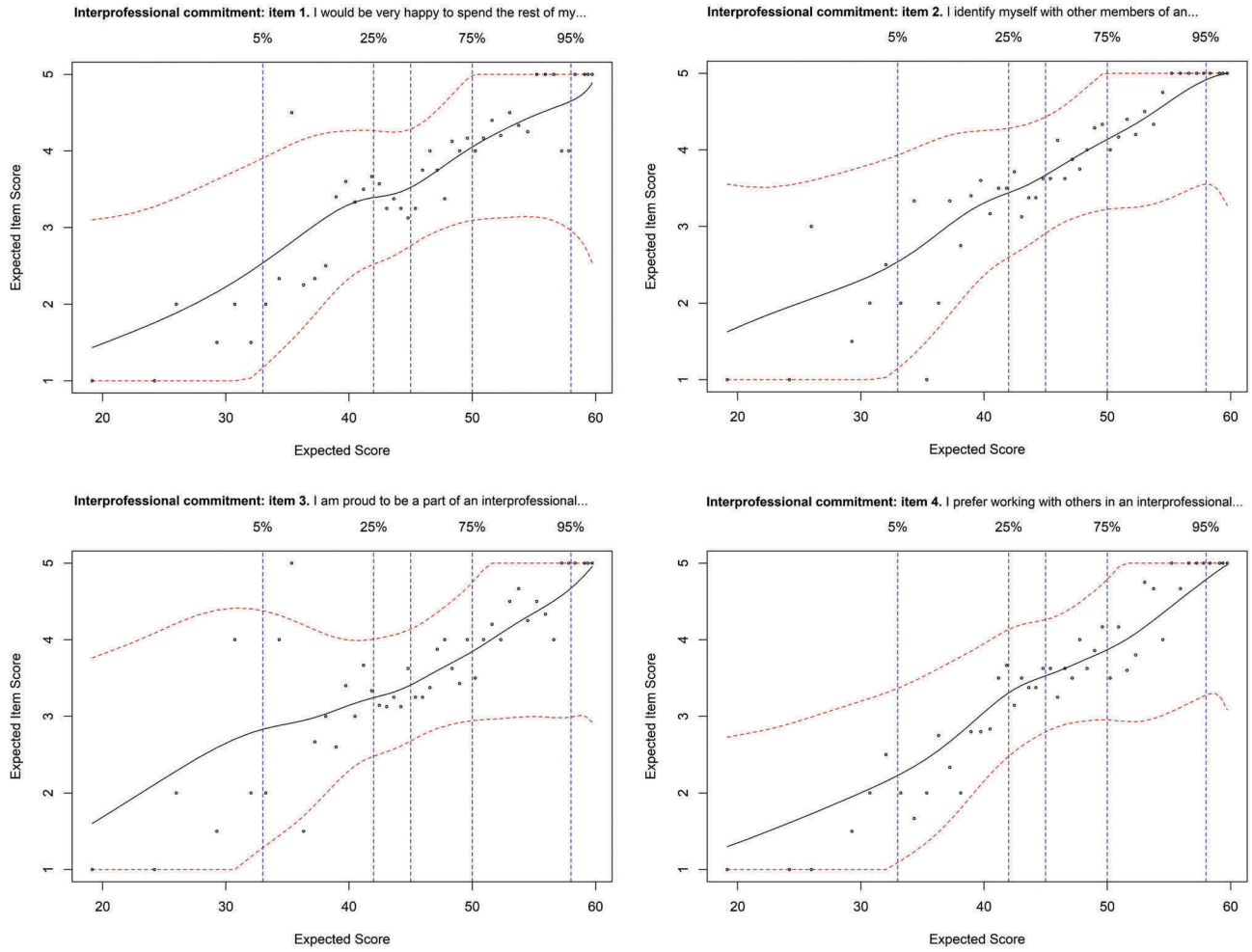

Figure 5. IRT plots of expected item scores related to expected scores of interprofessional commitment items (n = 200).

statistical cutoff of 0.70 (Nunnally, 1978; Nunnally & Bernstein, 1994). The lowest, but still amply sufficient, internal consistency regarded the subscale Interprofessional Belonging (Khalili, 2013). This second study was conducted to cross-validate previous results and, thus, could provide evidence for generalizability.

The percentage of explained variance in the second sample of this study was 65%. A factor solution of a psychological construct is considered satisfactory if it can account for sixty percent of the total variance (Hair et al., 2010). In our study, the percentages explained variance exceeded this norm considerably (Doorn & Rhebergen, 1998).

In this study a deductive scale development was used to guide for the selection and creation of items (Schwab, 1980). When exploring a new phenomenon, the inductive approach is usually used. When a theory already exists, the deductive approach would be most appropriate. Since the scale development of the EPIS was based on the Extended Professional Identity Theory (Reinders, 2018; Reinders et al., 2018a) the deductive approach is appropriate.

After the review of the initial item pool (Stage 3), two of the eight validation items from Interprofessional Belonging (subscale of DIS; Khalili, 2013) were not selected. These were reverse-scored items. Research indicates such recode items can have a detrimental effect on psychometric properties (Harrison & McLaughlin, 1991). For this reason we do not consider the exclusion of such items problematic.

More research is needed to further explore the predictive validity of the EPIS in both the educational and clinical setting with regard to interprofessional behaviors. Examples of such behaviors include any expression of interprofessional respect and professional equality, interprofessional consultation, joint decision-making, joint planning and working toward optimal joint outcomes (e.g. Khalili, 2013; King, Shaw, Orchard, & Miller, 2010; Orchard et al., 2012). This instrument could also be used to measure the influence of socialization factors and the effects of interventions intended to facilitate interprofessional identity formation. Furthermore, this instrument might also be useful for selection purposes since it can make a distinction between individuals with a weak or strong interprofessional identity regardless of their professional background. Finally, the EPIS could also be used as a basis for individual learning about one's own interprofessional identity. EPIS-scores of individual students could be a starting point for self-reflection in order to explore and become aware what determines their own degree of interprofessional identification.

Conclusion

The newly developed Extended Professional Identity Scale (EPIS) is a short but informative measurement instrument.

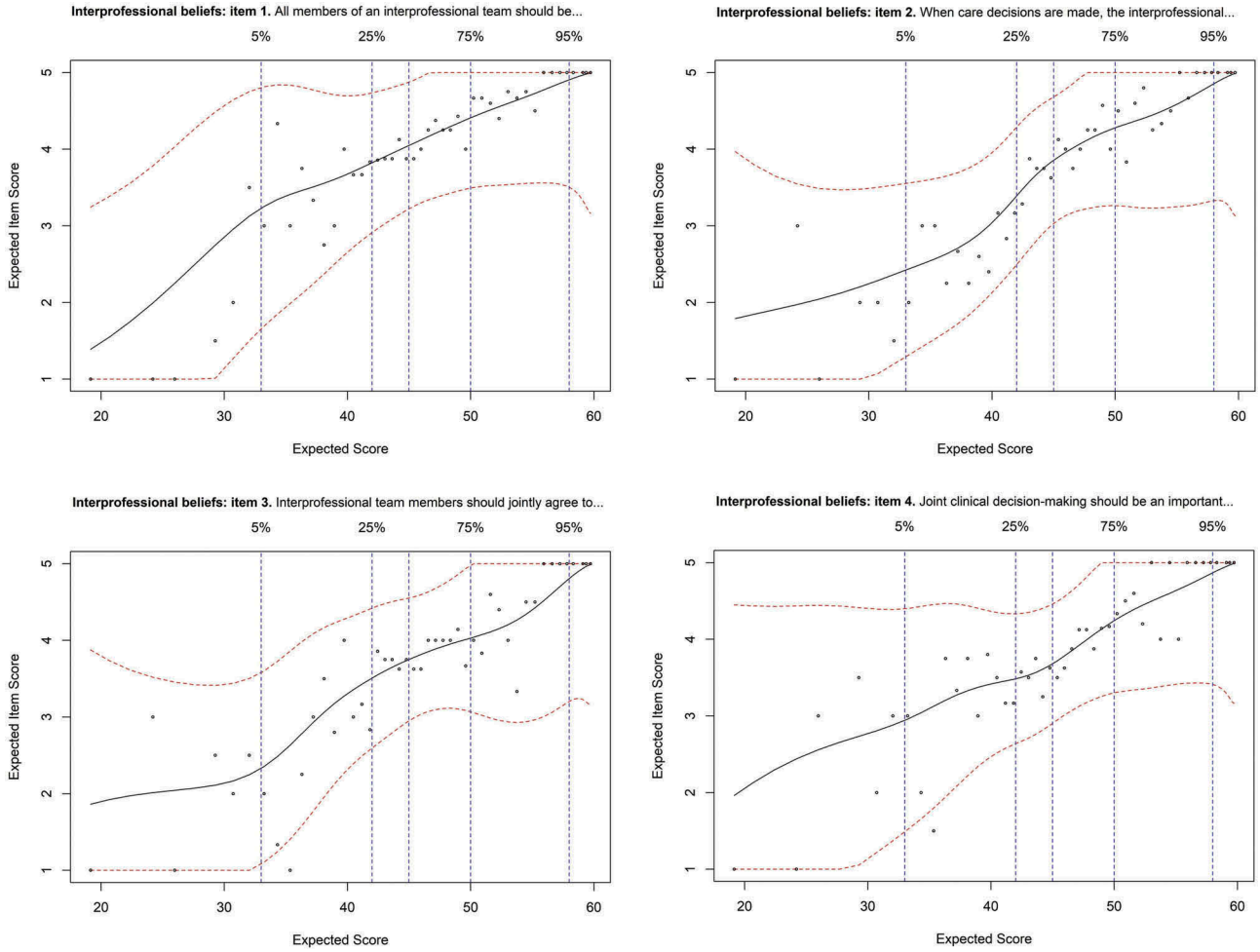

Figure 6. IRT plots of expected item scores related to expected scores of interprofessional beliefs items (n = 200).

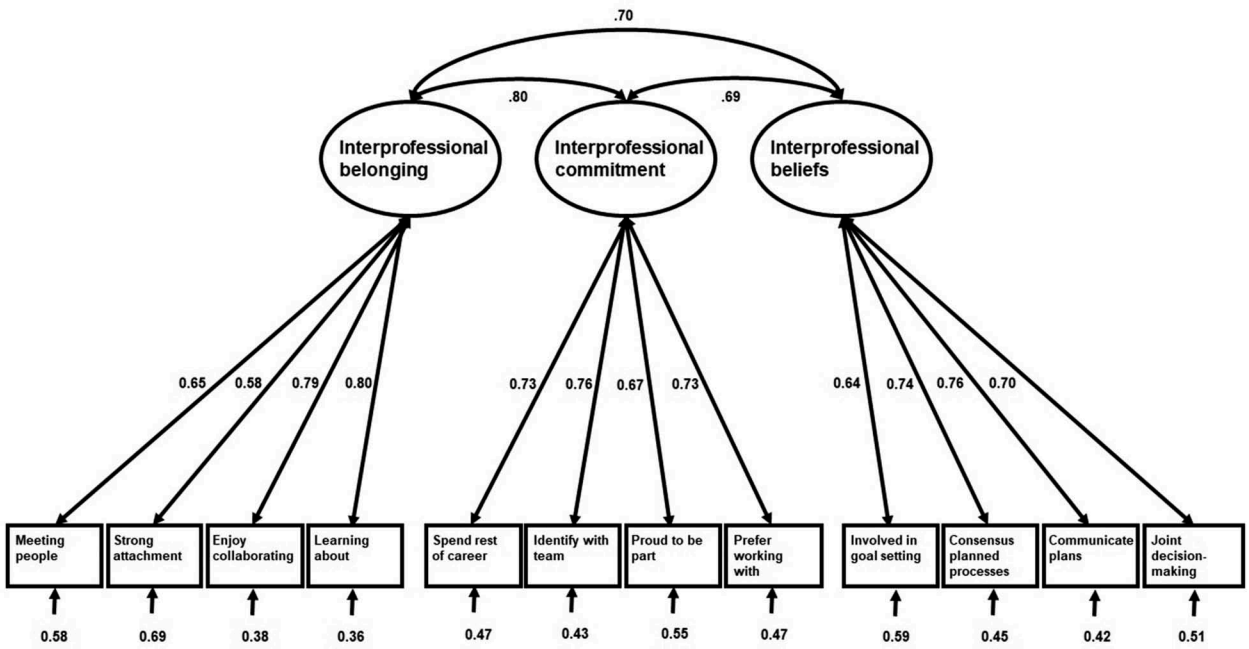

Figure 7. Three-factor model of the Extended Professional Identity Scale (EPIS) with standardized path coefficients.

It has sound psychometric properties like high reliability and high construct validity. The three factors measured by the subscales are similar to the interprofessional identity characteristics theorized by the Extended Professional Identity Theory (EPIT). Therefore, this study also supports the EPIT as a viable theory. Besides the evidence for three-dimensionality, all three factors are also interrelated. Thus, to some degree each factor should predict the other factors, but each factor also represents a distinct characteristic of the same construct. These findings are in accordance with the EPIT. Future research using the EPIS is encouraged to provide further evidence regarding its utility across interprofessional settings.

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Declaration of interest

The authors report no conflicts of interest. The authors alone are responsible for the content and writing of this article.

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