Development of Measuring Instruments Concerning Diversity in Physical Education: a Study within the Project „Schulsport 2020"

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Background

The project „Schulsport 2020" (QLB-project) aims to systematically develop the education of PE teachers considering current social challenges. One of three sub-projects addresses the topic "heterogeneity and promotion of inclusion". With the purpose of preparing students and also acting PE teachers for increasing heterogeneity within PE classes several studies have been performed to investigate actual class situations. Moreover, teachers' stress and teachers' and students' competencies and resources in dealing with heterogeneous class situations have been studied.

The present study comprises the development and validation of three different scales as written questionnaires to determine teachers' stress, attitudes, and self-efficacy towards heterogeneity. These scales are intended to serve as measuring instruments to scrutinize the current situation as a basis for further analyses and the development of learning tools.

Theoretical framework

In the course of rising diversity of our society also everyday school-life is influenced by increasingly heterogeneous pupils. In this context, migration and inclusive education are major impact factors (Frohn, 2013). PE classes are particularly affected by the pupils' heterogeneity as differences of physical and motivational aspects play a distinct role within this setting. These circumstances pose great challenges for PE teachers and may enhance teachers' stress levels (Frohn, 2013). A sense of self-efficacy and positive attitudes can serve as protective factors influencing professional teaching competences (Baumert, J. & Kunter, M., 2006; Abele, A. & Candova, A., 2007). Additionally, a positive attitude towards heterogeneity has been described as relevant requirement when teaching heterogeneous groups (Frohn, J. & Grimminger, E., 2013).

In order to evaluate relationships between attitudes, self-efficacy and teachers´ stress, this study aimed to develop respective scales comprising a broad range of heterogeneity dimensions existing in PE classes. Existing scales measuring attitudes (e.g. SACIE-Scale, Loreman, T., Earle, C., Sharma, U. & Forlin, C., 2007) and self-efficacy (e.g. TEIP-Scale, Sharma, U., Loreman, T. & Forlin, C., 2012) only comprise inclusive settings and focus special needs not especially focusing on the PE class education.

Methods

Work step 1: Detection of relevant dimensions of heterogeneity in PE classes:
literature review, expert survey

Work step 2: Generation of item pools for each scale based on the defined heterogeneity dimensions

Work step 3: 1. Expert validation and revision:
annotation of items by experts (sharpening of items, further differentiation of heterogeneity dimensions)

Work step 4: 2. Expert validation and revision

Work step 5: Instrument validation:
data collection, item analyses, exploratory factor analyses

Fig.1: Work steps of questionnaire development

Heterogeneity Dimensions

Gender
Culturally influenced behavior
Religious customs
Socioeconomic status
Talent
Athletic experience
Overweight
Underweight
Will to physically strain oneself
Self-confidence
Skin color
Sporting interests
Understanding of the teaching language
Special educational needs (SEN) in learning
Special educational needs (SEN) in language
Special educational needs (SEN) in hearing
Special educational needs (SEN) in seeing
Special educational needs (SEN) in social-emotional development
Special educational needs (SEN) in physical and motor development
Special educational needs (SEN) in cognitive development

Fig.2: List of the 20 final heterogeneity dimensions

Instruments:
- 3 Scales:
  Attitudes towards Heterogeneity in PE Classes (AH-PEC)
  Self-Efficacy in Teaching Heterogeneous PE Classes (SETH-PEC)
  Heterogeneity – related Stress in PE Classes (HS-PEC)
- 20 Items per scale
- 5 point scale

Subjects:
- n=750 (w = 482), age: 42,17 ± 10,36

Table.1: Subject distribution by type of school

Type of school	Total n	Female n
Primary school	391	340
Secondary school (Hauptschule)	33	16
Secondary school (Realschule)	60	25
Comprehensive school	20	5
Gymnasium	112	49
Secondary school	43	15
Vocational college	91	32

Table.2: Subject distribution by region

Region	Total n	Female n
Rural area	103	85
small city	171	120
Medium-sized city	234	143
Large city	216	112
Not specified	*21*	*19*

Item examples

Scale of attitudes towards heterogeneity (AH–PEC)

"... .Please rate PE with the following learner constellations. Joint teaching of..."
"... . Bitte bewerten Sie den Sportunterricht mit folgenden Lerngruppenzusammensetzungen. Gemeinsames Unterrichten von..."

Item 2: "... pupils with different culturally influenced behavior."
"...Schüler*innen mit unterschiedlichen kulturell bedingten Verhaltensweisen."
↗ *negative / rather negative / neutral / rather positive / positive*

Scale of self-efficacy towards heterogeneity (SETH-PEC)

" I am sure that that teaching PE does not pose any difficulties, if..."
" Ich bin mir sicher, dass das Unterrichten im Fach Sport mir keine Schwierigkeiten bereitet, wenn..."

Item 18: "...individual pupils have special educational needs in learning."
"... einzelne Schüler*innen einen Förderbedarf im Bereich Lernen haben."
↗ *does not apply at all/ ... / fully correct*

Scale of heterogeneity – related stress (HS-PEC)

"Please mark how stressful the individual situations are for you.(does not apply for situations that never occur)"
"Bitte kreuzen Sie an, wie belastend die Situationen für Sie sind. (entfällt für Situationen, die nie vorkommen)"

Item 5: "Different sporting interests of pupils"
"Unterschiedliche sportbezogene Interessen der Schüler*innen"
↗ *Stress: no / ... / very high*

Results

ITEM ANALYSES

1. *Item Discrimination :*
   - AH-PEC: high to very high item discrimination for all items ($.5 < r_{ix} < .85$)
   - SETH-PEC: high item discrimination for all items ($.4 < r_{ix} < .7$)
   - HS-PEC: high item discrimination for all items ($.4 < r_{ix} < .7$)
     expect of Item 18 ("underweight") $r_{ix} = .26$ and Item 20 ("skin color") $r_{ix} = .39$
     Further, both items show very low item difficulties.
   ⇒ ***Elimination of items "underweight" and "skin color" in all scales in order to ensure comparability***

2. *Internal consistency:*
   - AH-PEC: Cronbach`s α = .95
   - SETH-PEC: Cronbach`s α = .91
   - HS-PEC: Cronbach`s α = .91

EXPLORATORY FACTOR ANALYSES

Attitudes towards Heterogeneity in PE Classes (AH-PEC)

Table 3: Pattern matrix: Maximum Likelihood, Promax with Kaiser normalization

Item	Factor 1	Factor 2	Factor 3	h²
Talent (9)	**1.044**	.013	-.178	.854
Athletic experience (10)	**1.007**	-.014	-.106	.850
Sporting interests(19)	**.714**	-.019	.079	.582
Will to physically strain oneself (13)	**.551**	-.013	.316	.653
Self-confidence (16)	**.465**	.028	.352	.616
overweight (12)	**.447**	.130	.313	.654
Gender (1)	**.389**	-.101	.309	.348
SEN in seeing (7)	-.085	**.937**	-.101	.677
SEN in cognitive development (8)	-.044	**.918**	-.084	.698
SEN in hearing (11)	.040	**.786**	.025	.688
SEN in physical and motor development (5)	.082	**.607**	.139	.591
SEN in social-emotional development (14)	.097	**.472**	.207	.500
Religious customs (4)	-.109	-.046	**.944**	.692
Culturally influenced behavior (2)	.079	-.112	**.815**	.639
SEN in language (3)	-.051	.114	**.758**	.649
Socioeconomic status (6)	.170	.048	**.607**	.608
Understanding of the teaching language (20)	.202	.172	**.447**	.559
SEN in learning (15)	.069	.346	**.441**	.612
Explained variance [%]	43.6	39.84	46.64	63.72

MAP – Test: extraction of 3 factors
KMO = .95;
Bartlett`s Test: $\chi^2 = 9707.16$, df = 153, p < .001

Table 4: Factor-correlaion matrix

	Factor 1	Factor 2	Factor 3
Factor 1	1.00	.60	.76
Factor 2	.60	1.00	.72
Factor 3	.76	.72	1.00

Self-Efficacy in Teaching Heterogeneous PE Classes (SETH-PEC)

Table 5: Pattern matrix: Maximum Likelihood, Promax with Kaiser normalization

Item	Factor 1	Factor 2	Factor 3	h²
Athletic experience (9)	**.857**	-.053	-.007	.692
Talent (4)	**.823**	-.055	-.011	.631
Will to physically strain oneself (12)	**.761**	.129	-.155	.538
Self-confidence (7)	**.681**	.024	.106	.583
Sporting interests (1)	**.664**	-.057	.042	.445
Gender (8)	**.626**	-.222	.238	.506
Overweight (11)	**.591**	.244	.006	.541
SEN in seeing (10)	-.141	**.770**	-.025	.502
SEN in hearing (15)	-.172	**.713**	.180	.561
SEN in physical and motor development (13)	.277	**.705**	-.194	.572
SEN in social-emotional development (16)	.103	**.576**	-.072	.346
SEN in cognitive development (5)	-.119	**.449**	.207	.280
Understanding of the teaching language (19)	.047	**.388**	.302	.401
SEN in language (2)	-.043	.058	**.717**	.523
Religious customs (3)	.099	-.065	**.675**	.500
SEN in learning (18)	.073	.250	**.463**	.462
Socioeconomic status (6)	.388	-.069	**.432**	.495
Culturally influenced behavior (14)	.181	.207	**.393**	.438
Explained variance [%]	31.79	23.39	26.31	50.10

MAP – Test: extraction of 3 factors
KMO = .92;
Bartlett`s Test: $\chi^2 = 5527.75$, df = 153, p < .001

Table 6: Factor-correlaion matrix

	Factor 1	Factor 2	Factor 3
Factor 1	1.00	.44	.62
Factor 2	.44	1.00	.53
Factor 3	.62	.53	1.00

Heterogeneity – related Stress in PE Classes (HS-PEC)

Table 7: Pattern matrix: Maximum Likelihood, Promax with Kaiser normalization

Item	Factor 1	Factor 2	Factor 3	h²
Athletic experience (11)	**.852**	-.179	.068	.676
overweight (13)	**.754**	.034	-.220	.515
Talent (10)	**.698**	-.192	.393	.722
SEN in learning (16)	**.471**	.316	-.180	.375
Socioeconomic status (6)	**.463**	.212	.015	.343
Self-confidence (17)	**.411**	.047	.309	.381
SEN in seeing (7)	**.283**	.156	-.052	.126
Gender (1)	**.258**	.233	.184	.263
SEN in language (3)	-.152	**.572**	.215	.381
Culturally influenced behavior (2)	.078	**.481**	.139	.336
Understanding of the teaching language (19)	.095	**.471**	.007	.269
Religious customs (4)	.417	**.453**	-.156	.460
SEN in cognitive development (9)	.004	**.417**	.027	.183
SEN in social-emotional development (15)	-.149	**.392**	.337	.290
SEN in hearing (12)	.220	**.341**	-.052	.207
SEN in physical and motor development (5)	.073	**.289**	.279	.248
Will to physically strain oneself (14)	-.123	.039	**.751**	.529
Sporting interests (8)	.011	.115	**.654**	.495
Explained variance [%]	20.56	16.06	13.83	37.77

MAP – Test resulted in the extraction of 2 factors. As the respective EFA does not yield an interpretable factor structure a 3 factor solution, comparable to the other scales, was calculated.
KMO = .86;
Bartlett`s Test: $\chi^2 = 713.88$, df = 153, p < .001

Table 8: Factor-correlaion matrix

	Factor 1	Factor 2	Factor 3
Factor 1	1.00	.39	.36
Factor 2	.39	1.00	.31
Factor 3	.36	.31	1.00

Discussion

AH-PEC & SETH-PEC
⇒ 3-dimensional structure:
   factor 1: **physical & mental aspects**   factor 2: **inclusive settings**   factor 3: **socio-demographic aspects**
⇒ problem of understanding regarding the meaning of the items „Understanding of the teaching language" and „SEN in language"?
⇒ unexpected assignment of the item „SEN in learning"

HS –PEC
⇒ factor structure not clear
⇒ assignment of single items not clear („Gender", „Religious customs", „SEN in social-emotional development", „SEN in physical and motor development")

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