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The concerns about inclusive education scale: Dimensionality, factor structure, and development of a short-form version (CIES-SF)

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ABSTRACT

Teachers play a vital role in the implementation of inclusive education, and understanding where they have worries is essential to researchers and policymakers likewise. The Concerns about Inclusive Education Scale (CIES) is a frequently used scale globally to examine teachers' concerns but yielded mixed results regarding its factor structure. Using a large teacher sample ($N_1 = 538$), we analyzed its factor structure and made modifications informed by our analysis. Results favored a recently proposed factor solution over the original one. Based on this solution, a short form was created, which reduces the CIES length by 42%. It demonstrated excellent model fit in an additional validation sample ($N_2 = 537$), and efficiently and comprehensively assesses teacher concerns about inclusive education.

1. Introduction

The idea of an inclusive school system proposes that every child should receive education and necessary support in regular schools and classrooms, irrespective of special needs, and that there are no separated settings. Since the publication of the Salamanca Statement and Framework for Action on Special Needs Education (UNESCO, 1994) and Article 24 of the UN Convention on the Rights of Persons with Disabilities (UN General Assembly, 2006), demands for an inclusive school system have internationally gained much momentum. Many countries now have legislation or policies that support inclusion of students with special needs, which confronts teachers with new demands and challenges. Not surprisingly, a large body of research has examined teachers' attitudes, values, beliefs, and intentions regarding inclusive education. In this regard, teachers' attitudes toward inclusion (Avramidis & Norwich, 2002; de Boer, Pijl & Minnaert, 2011) and teachers' self-efficacy regarding inclusive teaching (e.g., Forlin, Sharma & Loreman, 2014; Sharma, Loreman & Forlin, 2012) are most frequently examined. Positive teacher attitudes, high self-efficacy, and few concerns are strong predictors of inclusive education practices (Sharma & Nuttal, 2016). Of these factors, teacher concerns about inclusive education have received relatively lesser attention from researchers, probably because attitude and self-efficacy are more prominent factors in social psychological theories of behavior (e.g., theory of planned behavior; Ajzen, 1991). However, it is not only important to know whether teachers are generally positive about the idea of inclusion, but also to elucidate why they are or are not. Understanding where teachers

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have worries or struggle with the idea of inclusive education not only acknowledges teachers' central role in the process but also informs politics and policymakers about teacher perceptions and support demands, helps to shape targeted teacher education programs, and makes it possible to monitor changes and progress in the implementation of inclusive education (Sharma & Nuttal, 2016; van den Berg & Ros, 1999; Yan & Deng, 2019).

1.1. *Concerns: antecedents of attitudes*

Concerns can be distinguished from attitudes and self-efficacy as negative outcome expectations to a specific behavior or event. While attitudes are often defined as the evaluative dimension of a concept (is something good or bad) and perceived efficacy is a judgment of capability (is one able to execute a given type of performance), outcome expectations are judgments about the likelihood of consequences of given behaviors (how likely will X follow as a consequence of Y; Ajzen & Fishbein, 2005; Fishbein, 1963). According to Ajzen and Fishbein (2005)), such expectations are direct antecedents of attitudes in that their aggregation results in an overall positive or negative evaluation. In the context of educational innovation, the concept "concerns" has also been used to describe feelings and preoccupations about changing demands and refers to questions, uncertainties, and resistance that teachers have in response to new situations, such as the implementation of inclusive education (van den Berg & Ros, 1999; Yan & Deng, 2019).

1.2. *State of research and the need for a reliable scale to assess teacher concerns*

In 1996, Scruggs and Mastropieri synthesized the findings from over 35 years of research from 28 studies on teacher's perception of inclusion. Their findings suggested that teachers' concerns were a key issue: "Only one third or less of teachers believed they had sufficient time, skills, training, or resources necessary for mainstreaming/inclusion" (Scruggs & Mastropieri, 1996 p. 59). Since then, many studies have examined teachers' concerns about inclusive education, and the themes most frequently reported seem to be fairly consistent across different teacher samples and over the past 30 years: insufficient resources and support, increased workload, lack of adequate teacher training, difficulties in classroom management, and fear of a decline in teaching / education quality (D'Alonzo, Giordano & Vanleeuwen, 1998; Heflin & Bullock, 1999; Hintz et al., 2015; Klibthong & Agbenyega, 2020; Wolery et al., 1994; Yu, 2019). However, due to the lack of standardized instruments, it is difficult to assess what progress has been made in addressing these concerns over the years, how concerns may change with varying degrees of experience with inclusive education or with specialized teacher training, or how concerns differ across countries with different cultures, histories, and policies.

Furthermore, studies investigating multiple teacher-related factors usually show strong negative relationships between concerns and attitudes, confidence, and intentions to include children with disabilities in the own classroom (e.g., Bruder, Dunst & Mogro-Wilson, 2011; Horne & Timmons, 2009; Li & Cheung, 2019; Miesera, DeVries, Jungjohann & Gebhardt, 2019; Mogharreban & Bruns, 2009; Navarro-Mateu, Franco-Ochoa, Valero-Moreno & Prado-Gascó, 2020; Seçer, 2010; Yada & Savolainen, 2017). For example, the studies by Yada and Savolainen (2017) and Li and Cheung (2019) demonstrated that fewer concerns about knowledge, workload, and overall feasibility of inclusive education were related to more positive attitudes overall and greater self-efficacy (especially with regard to classroom management). Moreover, Miesera et al. (2019) showed that lower concerns were strongly related to intentions to teach in inclusive classrooms. Establishing reliable instruments to assess teacher concerns thus has a significant practical value: while negative attitudes are a significant barrier in implementing inclusive education, there is hardly any research which reports how best to change negative attitudes. Assessing teachers' concerns about inclusion with reliable instruments thus helps to better address these concerns and to shape teacher education programs in a targeted way.

Lastly, the relationship between teacher concerns about inclusive education and teacher background variables such as gender, age, experience, grade level, and educational background have revealed inconsistent results (e.g., Avramidis, Bayliss & Burden, 2000; Forlin, Keen & Barrett, 2008; Horne & Timmons, 2009; Mohay & Reid, 2006; Seery, Davis & Johnson, 2000; Shah, Das, Desai & Tiwari, 2016). For example, Forlin et al. (2008) conclude that differences in concerns about inclusion among Australian teachers are, besides other factors, due to teaching experience, grade level of teaching, and experience in inclusion. In contrast, Yadav et al. (2015) find no relationship between education level or teaching experience of Indian teachers and their concerns about the inclusion of children with impairments. Park et al. (2018) argue that one reason for these inconsistencies could be the lack of cross-validation of the survey scales for the respective samples. Hence, establishing a reliable scale addressing teacher concerns would help resolve such discrepancies.

In the following section, we describe one frequently used scale, the *Concerns about Inclusive Education Scale* (CIES; Sharma & Desai, 2002), its development, and how different studies with different samples yielded different factor solutions of the scale, complicating the interpretation across samples and studies.

1.3. *The concerns about inclusive education scale (CIES) and its factor structure*

The original CIES was initially constructed to reflect concerns about inclusion, particularly in the context of the unique socio-educational and legal situation in India (Sharma & Desai, 2002). The scale since its development has been widely used across many countries (see following sections). It consists of 21 items describing different concerns (such as "I will not have enough time to plan educational programs for students with disabilities") to which participants respond on a four-point Likert scale (from "no concerns" to "extreme concerns"). The items of the scale were derived by carefully analyzing the literature that has looked at teacher concerns about teaching in inclusive classrooms. Based on a principal component analysis (PCA) followed by a Varimax rotation with data from 794 educators (310 principals and 484 teachers) from India, the authors identified four subfactors that underlie the concerns scale: (1) concerns about *Resources*, (2) concerns about *Acceptance*, (3) concerns about *Academic Standards*, and (4) concerns about

Workload (Sharma & Desai, 2002). Factor (1) *Resources* addressed concerns about resources (financial or human) and incorporated items such as "There will be inadequate para-professional staff available to support students with disabilities (e.g., speech pathologist, physiotherapist, Occupational therapist)" or "There will be inadequate administrative support to implement the inclusive education program". Factor (2) *Acceptance* addressed the teachers' acceptance of inclusion of students with disabilities more generally (e.g. "I do not have knowledge and skills required to teach students with disabilities") but also addressed specific concerns about the acceptance of students with disabilities by other peers or parents ("Students with disabilities will not be accepted by students without disabilities"). Factor (3) *Academic Standards* reflects concerns about not meeting up with academic demands due to the inclusion of students with disabilities and incorporated items such as "The overall academic standard of the school will suffer" or "It will be difficult to give equal attention to all students in an inclusive classroom". Lastly, factor (4) *Workload* addressed concerns about increased workload and unacceptable working conditions for the teacher and incorporated items such as "My workload will increase" and "I will not receive enough incentives (e.g., additional remuneration or allowance) to teach students with disabilities" (cf. Fig. 1).

This particular sub-factor structure has been used in many studies (e.g., Bhatnagar & Das, 2013; Sharma & Nuttal, 2016; Sharma & Sokal, 2016; Sharma, Ee & Desai, 2003, 2009, 2018; Sokal & Sharma, 2014; Sokal, Woloshyn & Funk-Unrau, 2013) to investigate the different facets of teacher concerns (i.e., scale scores on these subfactors). However, some studies tested the factor structure with different samples and came to quite different solutions or had to remove items due to low factor loadings or cross loadings (e.g., Miesera et al., 2019; Song, Sharma & Choi, 2019; see the following sections).

1.4. Exploratory factor analysis of the CIES

Researchers used the scale with samples differing in culture, educational role (e.g., regular or special education teachers), or teaching experience (pre- or in-service teachers) and often re-examined its factor structure accordingly. For example, Sharma, Forlin and Loreman (2007) examined data of 603 pre-service teachers originating from four different countries (Australia, Canada, Hong Kong, and Singapore). In a PCA followed by a Varimax rotation on the pooled sample, the authors found a similar four-factor solution, but with slight adaptions (items loading on Factor (1) *Resources* and Factor (4) *Workload* matched those of the original scale from 2002, but five items from the two other factors moved). Yadav, Das, Sharma and Tiwari (2015) revisited the CIES and extended the item pool. After factor analysis on the data of 175 Indian in-service teachers, their revised CIES resulted in 23 items with five subfactors: (1) *Classroom-related concerns*, (2) *School-related concerns*, (3) *Self-related concerns*, (4) *Academic Achievement-related concerns*, and (5) *Management-related concerns*. Shah et al. (2016) translated the CIES in Gujarati and determined its factor structure using a sample of 560 teachers. The result was a five-factor solution: (1) *Academic Achievement and Standards*, (2) *Infrastructural Resources*, (3) *Self-Efficacy*, (4) *Motivation*, and (5) *Social Acceptance*. For an overview, studies that investigated the factor structure of the CIES using explorative methods are listed in Table 1. Although one can expect that the use of explorative factor analytics will result in different outcomes across samples, the considerable variability in the number of factors and factor composition in different studies makes it clear that the initially found subfactors of the CIES should be interpreted with caution when applied to novel samples. This inconsistency becomes even more evident in studies that directly tested the original factor structure derived from the Indian sample using confirmatory factor analysis.

1.5. Confirmatory factor analysis of the CIES

Park, Dimitrov and Park (2018) tested the originally proposed CIES factor structure with 679 teachers from the United States. They conducted a total of four confirmatory factor analyses (CFA) to assess model fits of different models: 1) The initially proposed factor structure by Sharma and Desai (2002, p.5), where they did not consider the factors to be correlated, 2) the same model but with correlations between latent variables allowed, 3) a similar four-factor solution proposed by Park and colleagues but with substantial modification of the item composition of one of the factors, and 4) a one-factor model. None of the models, except the one by Park and colleagues, fit the data well (see Park et al., 2018, Table 2). Correlations among the four factors were very high, ranging from 0.78 to 0.90 (Park et al., 2018; Table 3), leading the authors to conclude that the four factors of the model are "highly correlated aspects of the essentially unidimensional construct for teachers' concerns about inclusive education" (Park et al., 2018, p. 9).

Miesera et al. (2019) validated a German translation of four popular teacher scales concerning inclusive education, including the CIES. They used CFA with a large sample of 909 German pre-service teachers to investigate the model fit of Sharma & Desai's (2002) proposed four-factor solution. The CIES fit the data poorly, and several modifications were required: Miesera and colleagues removed Item 5 and 6 from the *Acceptance* factor[1] due to low factor loadings and renamed the scale into *Competence* since the remaining items seemed unrelated to *Acceptance*. They also moved Item 17 to the *Academic Standards* factor and allowed the residuals of items 15 and 16 and items 3 and 19 to covary. With these modifications, the model showed an acceptable fit.

The results of Miesera et al. (2019) and Park et al. (2018) further demonstrate that the original factor structure of the CIES does not hold when assessed in different samples. Unsuitable factor solutions may be the reason for unreliable subfactors. For example, Gebhardt et al. (2018) reported a reliability of the *Acceptance* factor well below acceptable levels with a Cronbach's alpha of 0.53 and 0.35 in two separate samples. Adopting an unsuitable factor model may complicate the interpretation of scale values or even produces misleading results. An identical factor solution is also a basic requirement when comparing scale values between different samples

[1] In Miesera et a. (2019) the authors write that items 4 and 5 were removed (p. 109). We believe this to be a typo, since a) item 4 is not in the acceptance scale and b) it was not removed in Table 1 (p. 108).

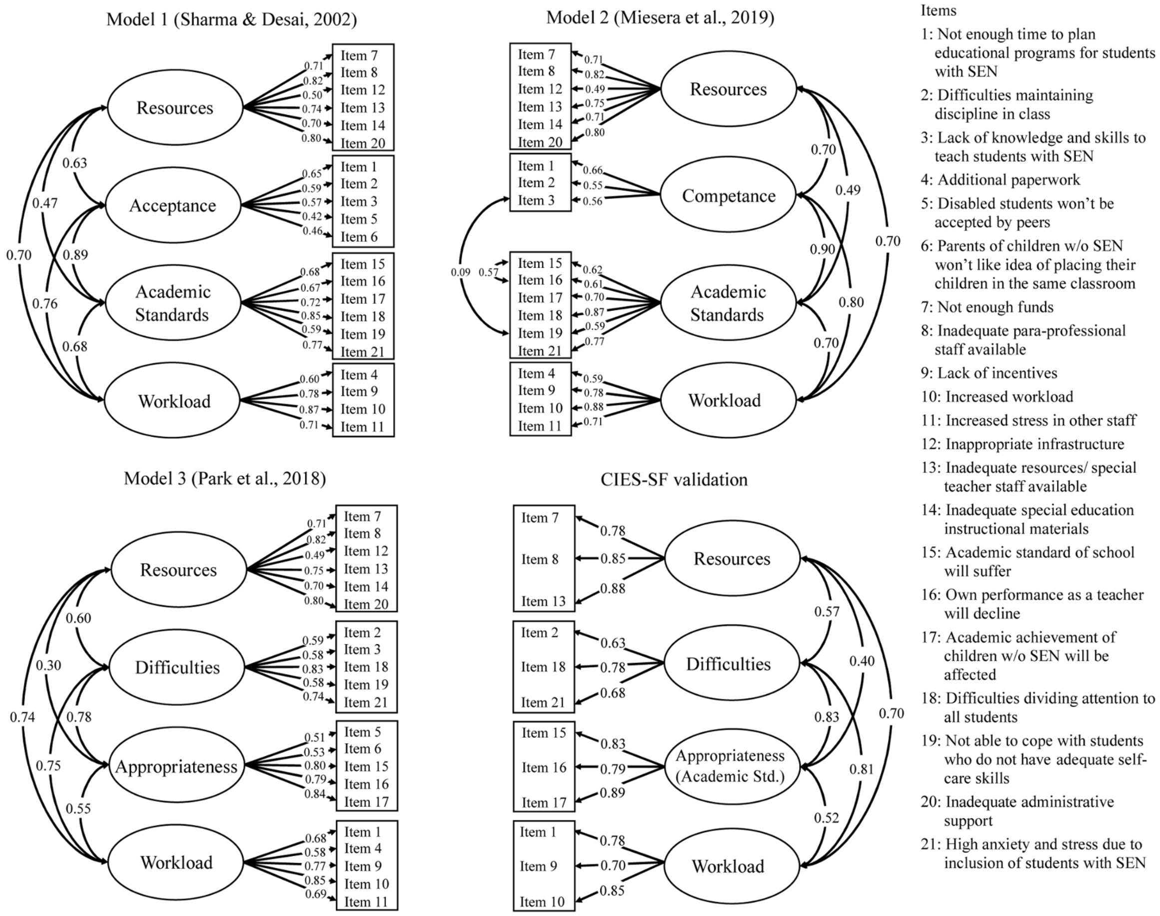

Fig. 1. Overview of Tested Models and Results, Including the CIES-SF.
Note: Factor loadings and correlations are standardized. Content descriptions of the 21 concern items of the original CIES are listed to the right. Model 1, 2, and 3 were calculated using sample 1. Validation of the CIES-SF was calculated using sample 2.

when measurement invariance has to be established. However, across most studies with a sufficiently large sample size, some factors keep showing up, indicating that these factors are quite stable across teaching contexts. For example, the factors *Resources* and *Workload* are found with identical item composition in multiple studies with very different samples (Loreman, Chris, Sharma & Forlin, 2007; Park et al., 2018; Sharma et al., 2007). The same is partially true for *Academic Standards*. Although the naming of the factor differs across studies/authors, the original items are mostly grouped together. Therefore, the CIES may be pruned to "core" concerns that could apply more generally, potentially demonstrating measurement invariance across a broader range of samples with different cultural or educational backgrounds.

1.6. *Purpose of the study*

Having reliable measurement instruments to investigate teachers' concerns is a crucial factor in investigating concerns about inclusive education. The current study was conducted for 1) testing different earlier proposed factor models of the CIES in a large teacher sample, and 2) creating and validating a shortened version (CIES-SF) that allows for an efficient assessment of specific teacher concerns about inclusive education.

Regarding our first aim, we investigated different proposed factor structures: 1) the original structure proposed by Sharma and Desai (2002), 2) the structure from Miesera et al. (2019), and 3) the structure proposed by Park et al. (2018). We used confirmatory factor analysis to test which proposed structure best fits the data of our teacher sample.

Regarding our second aim, we tried to reduce the length of the CIES and to create the CIES-SF (Concerns about Inclusive Education Scale – Short Form). The change in psychological research, with more and more complex research questions involving multiple constructs, leads to an increasing need for such short scales (Ziegler, Kemper & Kruyen, 2014). Reducing the length of the CIES can also make the scale more efficient by avoiding the collection of redundant information and careless responding of participants (Gibson & Bowling, 2019). Having a short form also benefits the quality criterion of test economy, which is met if a test requires few financial and time resources (Moosbrugger & Kelava, 2020). In a further validation step, the following requirements of the CIES-SF should be met:

Table 1
Exploratory factor analysis of the CIES.

Author / Year	Sample Size /Sample Type	Number / Name of Factors (corresponding Items)	Psychometric Data	Additional Information
Sharma and Desai (2002)	Total *N* = 794 Principals *N* = 310 Teachers *N* = 484 India In-Service Teachers/ Principals	1. Resources (7,8,12,13,14,20) 2. Acceptance (1,2,3,5,6) 3. Academic Standards (15,16,17,18,19,21) 4. Workload (4,9,10,11)	α total = 0.91 α_1 = 0.82 / EV: 15.9% α_2 = 0.70 / EV: 14.1% α_3 = 0.84 / EV: 13.6% α_4 = 0.74 / EV: 11.6%	Original Study
Loreman, Earle, Sharma & Forlin (2007)*	Total *N* = 966 West. Australia = 208 Victoria, Australia =57 Canada = 191 Singapore = 102 Hong Kong = 438 Pre-Service Teachers	1. Workload and Stress (4,9,10,11,15,21) 2. Resources (7,8,12,13,14,20) 3. Time, Training & Competence (1,2,3,18,19,21) 4. Other student relationship (2,5,6) 5. Academic impact on rest of class (15,16,17,18,21)	EV_1: 14.5% EV_2: 17.1% EV_3: 11.5% EV_4: 8.5% EV_5: 12.4%	PCA on a pooled sample
Sharma et al. (2007)*	Total *N* = 603 West. Australia =153 Victoria, Australia =92 Canada = 58 Singapore = 93 Hong Kong = 182 Pre-Service Teachers	1. Resources (7,8,12,13,14,20) 2. Acceptance (1,2,3,18,19,21) . Academic Standards (5,6,15,16,17) 4. Workload (4,9,10,11)	α total. = 0.92 α_1 = 0.87 / EV: 18.0% α_2 = 0.82 / EV: 13.3% α_3 = 0.79 / EV: 13.4% α_4 = 0.79 / EV: 14.3%	PCA on a pooled sample
Kuyini and Mangope (2011)	Total *N* = 202 Ghana, Botswana Pre-Service Teachers	1. Resources (12,13,14,20) 2. Welfare and Workload (2,4,10,11,21) 3. Academic (3,15,16,17) 4. Acceptance (5,6) 5. Support (7,8,18) 6. Coping (1,9,19)	α_1 = 0.68 α_2 = 0.70 α_3 = 0.64 α_4 = 0.67 α_5 = 0.51 α_6 = 0.64	
Woodcock, Hemmings and Kay (2012)	Total *N* = 102 Australia Pre-Service Teachers	4 Factors (using 20 Items) *"The four factors were consistent with the* Sharma and Desai (2002)*constructs/factors and were labelled accordingly"* (S. 4)	*"Cronbach's alpha results in the acceptable range* (i.e., *>0.7)"* (p. 5) for each factor	One item got deleted (Study does not state which one) Corresponding items to factors are not reported
Yadav et al. (2015)*	Total *N* = 175 India In-Service Teachers	1. Classroom-related concerns (9 items) 2. School-related concerns (4 items) 3. Self-related concerns (4 items) 4. Academic Achievement-related concerns (3 items) 5. Management-related concerns (3 items)	α total = 0.88	Development of the CIES-R with 23 Items Some Items from the original study were adapted
Shah et al. (2016)*	Total *N* = 560 Ahmedabad, India In-Service Teachers	1.Concerns about Academic Achievement and Standards 2. Concerns about Infrastructural resources 3. Concerns about Self-Efficacy 4. Concerns about Motivation 5. Concerns about Social Acceptance	α total = 0.91	Development of CIE-G Scale (CIES in Gujarati) Corresponding items to factors are not reported

Note: All studies performed a PCA or did not indicate the factor analytic method.
*Studies did not indicate the criterion for the number of factors retained. α: Indicates the Cronbach Alpha of the respective factor. EV: Indicates the Eigenvalue of the respective factor.

Table 2
Participants' background variables.

Variable	Total Sample N (%)	Sample 1 N (%)	Sample 2 N (%)
Sex			
Female	826 (76.8)	425 (79.0)	401 (74.7)
Male	240 (22.3)	110 (20.4)	130 (24.2)
Other	9 (0.8)	3 (0.6)	6 (1.1)
Age			
< 25 years	47 (4.4)	28 (5.2)	19 (3.5)
25 – 30 years	153 (14.2)	77 (14.3)	76 (14.2)
31 – 40 years	203 (18.9)	101 (18.8)	102 (19.0)
> 40 years	672 (62.5)	332 (61.7)	340 (63.3)
Teaching experience			
< 1 year	16 (1.5)	9 (1.7)	7 (1.3)
1 – 3 years	100 (9.3)	50 (9.3)	50 (9.3)
4 – 10 years	195 (18.1)	102 (19.0)	93 (17.3)
> 10 years	764 (71.1)	377 (70.1)	387 (72.1)
Teaching level			
Preschool	224 (20.8)	116 (21.6)	108 (20.1)
Primary	592 (55.1)	304 (56.5)	288 (53.6)
Secondary	259 (24.1)	118 (21.9)	141 (26.3)

reaching a similar to improved model fit compared with the full-length CIES when using a CFA applied to a different sample, a high matching between the CIES-SF and CIES total score/subscales scores (correlations of $r > 0.90$), similar correlations among subscales in the two versions (CIES and CIES-SF), and fulfilling reliability standards of internal consistency (McDonald's omega > 0.7).

Table 3
Different model fits of Sample 1 and validation of the CIES-SF with Sample 2.

Sample	CFA model	χ^2	df	χ^2/df	CFI	SRMR	RMSEA (90% CI)
1	Model 1 (Sharma & Desai)	830.042	183	4.54	0.891	0.082	0.081 (0.076 – 0.087)
1	Model 2 (Miesera et al.)	674.712	144	4.69	0.905	0.077	0.085 (0.077 – 0.089)
1	Model 3 (Park et al.)	520.490	183	2.84	0.943	0.063	0.059 (0.053 – 0.065)
2	CIES-SF (validation)	86.564	48	1.80	0.990	0.034	0.039 (0.025 – 0.052)

Note: Model 1, 2, and 3 were calculated using Sample 1, the CIES-SF was validated using Sample 2. For reference, the fit of Park and colleague's sample for Model 3 is: χ^2=982.240, CFI=0.963, RMSEA=0.080 (0.075–0.085) (Park et al., 2018; Table 2).

2. Method

2.1. Participants

In collaboration with a regional professional association of teachers with several thousand members, we collected data from preschool, primary, and secondary regular in-service teachers using an online survey. We additionally sent the link to the survey to school principals of two hundred randomly selected schools in the German-speaking part of Switzerland, with the request to forward it to their teachers. A total of 1075 regular preschool, primary and secondary school teachers voluntarily filled in a complete survey. The distributions of participants' background variables (and the two randomly created samples, see below for further details) are shown in Table 2. Due to the anonymous procedure of data collection, we could not calculate a response rate. However, for teaching level, sex, and age, the sample characteristics represent the general teacher population in Switzerland quite accurately (Swiss Federal Statistical Office, 2018).

2.2. Instrumentation

Besides general demographical questions, participants received a definition of the concept of inclusive education and then answered each of the 21 Items of the CIES (for a listing of the content of the items, see Fig. 1). We used the German translation of the CIES by Gebhardt et al. (2018), and participants could indicate their agreements with the statements on a unipolar 4-point Likert-type scale ranging from 1 (*not at all concerned*) to 4 (*extremely concerned*). We calculated the degree of total concern by the mean value of all items, while for the degree of concern on a subfactor, we calculated the mean of the items corresponding to the respective subfactor.

2.3. Procedure

We tested three factor solutions that were proposed in previous studies:

1. The original factor solution by Sharma and Desai (2002), referred to as Model 1, with the latent factors allowed to covary.
2. The factor solution by Miesera et al. (2019), referred to as Model 2, with the identical factors *Resources, Workload*, and *Academic Standards*,[2] but with Item 5 and 6 removed from the *Acceptance* factor due to low factor loadings (since the remaining items 1, 2 and 3 did not convincingly relate to *Acceptance*, Miesera and colleagues renamed the factor to *Competence*), and with residuals of item 15 and 16 and 3 and 19 allowed to covary.
3. Lastly, the solution proposed by Park et al. (2018), referred to as Model 3. Here, the factor *Resources* is identical to the other two models. However, the factor *Workload* additionally contains item 1, and there are two new factors *Appropriateness* (with items 15, 16, and 17 similar to the *Academic Standards* factor of Model 1 and 2) and *Difficulties*.

All models are shown in Fig. 1 with factor loadings, factor correlations, and residual correlations displayed.

2.4. Statistical analyses

We performed all analyses using the statistical programming language R (R Core Team, 2019). Because the aim of this study was not only to test different proposed factor structures of the CIES but also to create a short form based on the best-fitting model, we started our analysis by splitting our total sample into two subsamples: one sample for confirmatory factor analysis and model fitting and a second sample for validation purposes of the shortened form of the CIES only. Because we used model fits and item loadings to reduce the scale-length, and these depend on sample characteristics, independent validation of the shortened scale on a different sample was necessary to reach unbiased conclusions. To this end, the total sample was randomly split in half while controlling for similar overall CIES scores in both subsamples, using the *minDiff* package (Papenberg, 2018). In a first step, to determine the best fitting factor

[2] Miesera and colleagues state in their paper that the item 17 was moved from the *Workload* factor to the *Academic Standards*. However, as confirmed by the authors Sharma and Desai, item 17 actually belongs to the *Academic Standards* factor, as this was a typo in their original manuscript.

solution of the three models for our sample of regular in-service teachers, we conducted separate CFA's using the lavaan package (Rosseel, 2012) on sample 1 (see section "confirmatory factor analyses"). In a second step, we selected the best fitting factor solution and reduced the CIES to a more efficient short-form scale (see section "creation of the CIES-SF"). Finally, using the independent sample 2, we performed an additional CFA and further psychometric assessments on this shortened version of the CIES for validation purposes (see section "psychometric analyses of the CIES-SF").

2.4.1. Confirmatory factor analyses

To determine model fit and estimate parameters, we applied the unweighted least square (ULS) estimation method and, due to the non-normal distribution of the data, used mean and variance adjusted Chi-square test statistics. In lavaan, this combination is called ULSMV (unweighted least square mean and variance adjusted) estimation. ULSMV uses a polychronic correlation matrix to determine parameter estimation and is considered to be superior to theory-based maximum likelihood (ML) when observed variables are ordinal (Li, 2014, 2016), especially when these indicators have fewer than six categories (Kline, 2016). It has also been shown that ULSMV provides more precise and less variable parameter estimates and more accurate standard errors than diagonal weighted least squares (DWLS) estimators (Forero, Maydeu-Olivares & Gallardo-Pujol, 2009; Li, 2014). Missing cases were removed pairwise.

Evidence for model-data fit is provided if the χ^2 value is not statistically significant. In this case, the implied covariance matrix of the model and the observed covariance matrix of the data do not differ significantly. However, since the χ^2 test is susceptible to sample size (Dimitrov, 2012, p. 104), we additionally evaluated model fit using a range of different fit indices: 1) comparative fit index (CFI), 2) standardized root mean square residual (SRMR), and 3) root mean square error of approximation (RMSEA). We followed the convention by Hu and Bentler (1999) and considered a fit with RMSEA < 0.08, SRMR < 0.08, and CFI > 0.90 to be acceptable and a fit with RMSEA < 0.05, SRMR < 0.05, and CFI > 0.95 to be good. When calculating CFA's using ordinal indicators (ULS estimators), RMSEA and CFI can sometimes yield overoptimistic fit indices and, therefore, may fail to discover model-data misfit (Savalei, 2020; Xia & Yang, 2019). However, due to the lack of (practical) alternatives, we used Hu & Bentler's (1999) cut-off values and interpreted these with caution. Because SRMR seems not affected by the estimation method and hence, is a reliable fit index when the CFA uses ordinal indicators (Shi & Maydeu-Olivares, 2020), the main focus for model fit evaluation was on the SRMR.

2.4.2. Creation of the CIES-SF

Our main goal for the creation of a shortened version of the CIES was to reduce the item number substantially without changing the latent construct: all subfactors of the best fitting model should be adequately represented while using not more than three items to maximize efficiency. When constructing latent variables with less than three indicators, estimation problems may occur (Brown, 2015). We used three criteria to decide which items to keep and which to remove: 1) item-content fit (removal of the item if the content of an item did not fully match the narrative of the subfactor), 2) substantial factor loading (removal of the item if it had a weak factor loading, e.g., below 0.5, where the latent variable explains less than 25% of the variance in this item), and 3) low cross-loadings (removal of the item if modifications indices indicated that it loaded on multiple subfactors, therefore causing substantial misfit and high correlations between subfactors). Conceptual fitting of an item always had the highest priority; we used factor loadings and modifications indices as additional decision aides.

2.4.3. Psychometric analysis of the CIES-SF

Besides testing the model fit of the created short form of the CIES using standard confirmatory factor analysis on sample 2, we additionally performed psychometric analyses to validate the CIES-SF. We used the complete sample to calculate scale reliabilities and the total scale/subscale correlations between the CIES and the CIES-SF. To calculate the correlations, we used Pearson's *r*. To calculate the scale reliabilities, we used McDonald's omega. Although Cronbach's alpha is the dominant measure of reliability reported in studies that rely on a multi-item measurement instrument (Goodboy & Martin, 2020; Hayes & Coutts, 2020), a number of researchers argue against its use and recommend using McDonald's omega instead (e.g., Dunn, Baguley & Brunsden, 2014; Goodboy & Martin, 2020; Hayes & Coutts, 2020; McNeish, 2018; Peters, 2014; Revelle & Zinbarg, 2009; Sijtsma, 2009). Even Cronbach himself no longer recommends its use (Cronbach & Shavelson, 2004). In contrast to Cronbach's alpha, McDonald's omega is designed for congeneric scales, meaning the items vary in how strongly they are related to the construct being measured (McNeish, 2018), and it is not influenced by the number of items used (Hayes & Coutts, 2020, p. 4). The latter aspect is especially limiting for our use case since our goal is to reduce the item count of the CIES. There are multiple variations of McDonalds' omega, used in this study is *omega total* which reflects the *true score variance* divided by the *total observed variance* in a unidimensional scale (Dunn et al., 2014). Omega values can be interpreted in the same way as Cronbach's alpha values (i.e., values > 0.7 reflect acceptable, > 0.8 good and > 0.9 excellent reliability). Assuming ordinal levels, we used the *userfriendlyscience* package (Peters, 2018) for all calculations.

3. Results

3.1. Subsamples

The random splitting of the complete sample resulted in two subsamples with similar total CIES scores (Sample 1: $n = 538$, Sample 2: $n = 537$). The resulting samples did neither significantly differ for gender ($\chi^2(1) = 2.13$, $p = .15$), age ($\chi^2(3) = 1.83$, $p = .61$), teaching experience ($\chi^2(3) = 0.795$, $p = .85$), nor teaching levels ($\chi^2(2) = 2.76$, $p = .25$). Background variables of both samples are listed in Table 2.

3.2. Model fit results

Table 3 summarizes the separate CFA's that were conducted to determine which model best fits the data of our sample. The original Model 1 by Sharma and Desai (2002) yielded a poor data fit; all fit indices were below acceptable thresholds. Model 2 by Miesera et al. (2019) (with items 5 and 6 removed and some residuals allowed to covary) led to an overall improved model fit, reflected by a higher CFI and a lower SRMR. However, the RMSEA still indicated a model-data misfit. Model 3 by Park et al. (2018) showed a massively improved model fit with all fit indices in an acceptable range. The CFI was well above 0.9 and the SRMR and the 90% confidence interval of the RMSEA below 0.08, indicating a good model-data fit. These Results favor the solution by Park and colleagues.

3.3. Item reduction to create the CIES-SF

Because of the acceptable model fit, we used the factor solution proposed by Park et al. (2018) (Model 3) to derive the short form of the CIES (CIES-SF). The reduction of the items was based on the three criteria 1) item-content fit, 2) substantial factor loading, and 3) low cross-loadings. For a better overview, the retained items are shown in Table 4.

3.3.1. Resources

For the factor *Resources*, we retained items 7, 8, and 13. Conceptually, these three items all reflect different concerns relating to insufficient human and financial resources regarding inclusive education. Item 7 was preferred over item 14 as it is less specific and covers concerns about financial resources in general. We dropped item 12 due to its low factor loadings and item 20 because of substantial cross-loadings on all the other three factors.

3.3.2. Difficulties

For the factor *Difficulties*, we retained items 2, 18, and 21. These items cover different aspects of concerns about difficulties with teaching in inclusive classrooms (maintaining discipline, giving equal attention to all students) and the effects it has on teachers (stress, anxiety). Items 18 and 21 both had high loadings (above 0.7) and matched the narrative of the factor of general difficulties with inclusive education teaching. Besides lower factor loadings, Items 3 and 19 deal with concerns about teacher self-efficacy rather than with concerns about inclusive education per se, so we removed them.

3.3.3. Appropriateness (Academic standards)

For the factor *Appropriateness*, we retained items 15, 16, and 17. These items all cover concerns about declining academic performance in teaching and learning in inclusive classrooms. All items showed high factor loadings and are thematically similar. In contrast, items 5 and 6 showed low loadings, and they did not fit thematically, so we removed them. Because the retained items are concerns mainly related to declining academic performance because of inclusive education, we suggest keeping the original naming *Academic Standards* by Sharma and Desai (2002) rather than the naming by Park et al. (2018) (*Appropriateness*).

3.3.4. Workload

For the factor *Workload*, we retained items 1, 9, and 10. These items showed high factor loadings and covered concerns about workload in terms of lack of time to plan extra educational programs, not enough incentives for the additional work, and increased workload in general.

3.3.5. Validation of the CIES-SF

Because the final CIES-SF (see Fig. 1) is derived from fit measurements, factor loadings, and modifications indices obtained from

Table 4
Concerns about Inclusive Education Scale – Short Form (CIES-SF).

Factor	Item	Description
Resources	7	My school will not have enough funds to implement inclusion successfully
	8	There will be inadequate para-professional staff available to support students with disabilities (e.g., speech pathologist, physiotherapist, Occupational therapist)
	13	There will be inadequate resources/special teacher staff available to support inclusion
Difficulties	2	It will be difficult to maintain discipline in class
	18	It will be difficult to give equal attention to all students in an inclusive classroom
	17	The inclusion of a student with a disability in my class will lead to a higher degree of anxiety and stress in me
Appropriateness (Academic Standards)	15	The overall academic standard of the school will suffer
	16	My performance as a classroom teacher will decline
	17	The academic achievement of students without disabilities will be affected
Workload	1	I will not have enough time to plan educational programs for students with disabilities
	9	I will not receive enough incentives (e.g. additional remuneration or allowance) to teach students with disabilities
	10	My workload will increase

Note: Full length CIES can be found in Sharma and Desai (2002). Respond scale: 1 = Not at all concerned, 2 = A little concerned, 3 = Very concerned, 4 = Extremely concerned.

Sample 1, we validated the newly formed scale using Sample 2. Model fit of the CIES-SF with sample 2 is shown in Table 3. All fit indices indicated an excellent model fit (CFI = 0.99, SRMR = 0.034; RMSEA = 0.039).

3.4. Reliability and score correlations of the CIES-SF

3.4.1. Reliability

We calculated McDonald's omega total to determine internal consistency of the CIES-SF and its subscales. The total CIES-SF shows good reliability with ω = 0.89. Subscale reliabilities ranged from acceptable (*Difficulties*: ω = 0.74) to good (*Workload*: ω = 0.83; *Resources*: ω = 0.87; *Appropriateness*: ω = 0.88).

3.4.2. Score correlations CIES-SF

The goal of creating the CIES-SF was to assess the same latent construct as the CIES without a noteworthy loss of explained variance. Further, the CIES-SF scores should have similar correlations among the subscales compared to the full-length scale. Table 5 shows the correlations between the CIES-SF and the CIES and the subscale scores. Total scale values correlate with $r = 0.96$; subscale values correlate from $r = 0.89$ to $r = 0.94$. Patterns of subscale relationships are similar in the CIES and CIES-SF. In general, correlations among the subfactors of the CIES-SF are a little lower, indicating a somewhat more substantial distinctiveness.

4. Discussion

The goals of this study were 1) to resolve open questions regarding the factor structure of the CIES using a large teacher sample and 2) to shorten the scale for a more economic assessment of teacher concerns about inclusive education.

4.1. Improved factor structure of the cies

Regarding factor structure, we tested different earlier proposed factor solutions and assessed model-data fit. The original factor solution by Sharma and Desai (2002), as well as the solution by Miesera et al. (2019) (with minor changes in the composition of the *Acceptance* subfactor), did not match the latent construct of teacher concerns about inclusive education in our teacher sample. The most problematic aspect seemed to be the unstable factor *Acceptance* and some items of other factors that had high cross loadings on other factors. However, the factor solution proposed by Park et al. (2018) fit our teacher sample reasonably well. Park and colleagues substantially rearranged the items of Sharma and Desai's factors *Acceptance* and *Academic Standards*. They changed the *Acceptance* factor into a factor *Difficulties* and removed two items that dealt with the acceptance of students with disabilities by other students and their parents. These two items had also been removed by Miesera and colleagues (after which they renamed the factor *Acceptance* to *Competence*). These two items, which were probably the anchor items for the original naming of the factor *Acceptance* in the study by Sharma and Desai, are, therefore, a recurrent source of model-data misfit. The rearrangement of Park and colleagues (placement of the two items to other items measuring concerns about declining academic standards) resulted in improved model fit. However, it seems evident that both in terms of content and scale reliability, conciseness of the scale improves when discarding these two items. Apart from the unstable factor *Acceptance*, the other original factors *Resources, Academic Standards* and *Workload* in the study by Sharma and Desai can be identified in most of the previous studies (e.g., Kuyini, Desai & Sharma, 2018; Loreman et al., 2007; Miesera et al., 2019), even in the proposed factor structure by Park and colleagues (three of the five items of the factor *Appropriateness* refer to declining academic standards, as mentioned before).

4.2. CIES-SF: reduced length scale with excellent fit

Due to good model-data fit, we chose the factor structure proposed by Park and colleagues as a basis to create a short form of the CIES. The main objective was to reduce the number of scale items without changing the latent construct of concerns regarding inclusive

Table 5
Factor and subfactor correlations of the CIES and CIES-SF.

Factor	1.	2.	3.	4.	5.	6.	7.	8.	9.
1. Resources	1								
2. Difficulties	.46	1							
3. Appropriateness (Academic Standard)	.31	.60	1						
4. Workload	.58	.58	.44	1					
5. Resources-SF	**.89**	.38	.23	.51	1				
6. Difficulties-SF	.43	**.92**	.62	.58	.35	1			
7. Appropriateness (Academic Standard)-SF	.29	.58	**.93**	.42	.21	.60	1		
8. Workload-SF	.56	.56	.38	**.94**	.52	.55	.37	1	
9. CIES total mean	.78	.82	.79	.82	.66	.80	.68	.77	1
10. CIES-SF total mean	.71	.80	.72	.80	.69	.82	.73	.80	**.96**

Note: Displayed are standardized Pearson correlations. Calculations based on the total sample. All correlations were statistically significant ($p < .001$). Correlations of the CIES-SF and CIES of the subscale/total scores are displayed in bold.

education or losing information. We believe in having achieved this goal: a validation of the CIES-SF using a similar but independent sample yielded an excellent model-data fit, subscale and total scores did highly correlate with the CIES scores, and internal consistency was acceptable (*Difficulties*) or good (*Resources, Academic Standards, Workload*). Consistent with the observation by Park and colleagues, the four subscales are correlated, but each subscale also explains sufficient factor-specific variance. Therefore, an interpretation of the total scale result is meaningful, but each subscale can also be interpreted independently. Factor 1 (*Resources*) of the CIES-SF reflects concerns about resources (financial or human) to implement inclusive education successfully. Factor 2 (*Difficulties*) addresses concerns about difficulties in implementing inclusive education. It is the broadest subfactor of the CIES-SF, as indicated by the high correlations between the total CIES-SF score and the other subscales. Factor 3 (*Academic Standards*) reflects concerns about not meeting up with academic demands and was renamed by us to the original naming by Sharma and Desai, which is more accurate than *Appropriateness* after removing two misfitting items. Lastly, factor 4 (*Workload*) addresses concerns about less time and higher workload because of inclusive education.

4.3. Limitations in the validity of the current CIES / CIES-SF scales

Although the factor structure proposed by Park and colleagues fitted well to our data, and we were able to reduce the length of the CIES-SF, we need to mention some limitations. First, our sample consisted of Swiss regular teachers. The better fit with the factor structure proposed by Park and colleagues could be due to the similarity of the samples (both teachers in western countries) and need not to hold for non-western teachers (Sharma & Desai, 2002), teachers differing in educational background (special education or student-teacher samples; Miesera et al., 2019) or for educators in general (i.e., administrators or paraprofessionals). Second, the four factors of the CIES-SF may reflect prominent but certainly not all possible dimensions of concerns about inclusive education. For example, items dealing with beliefs about negative consequences for children with disabilities are currently not part of the CIES-SF, although the lack of acceptance by peers and social isolation of children with disabilities is an often discussed aspect in inclusive education research (de Boer, Pijl & Minnaert, 2012) and potentially a source of teacher concerns as well. Future studies could investigate whether the CIES-SF appropriately reflects the most critical teacher concerns or if more dimensions could or should be added. In this case, we suggest assessing content validity by practicing teachers. Finally, although the subfactor *Difficulties* has acceptable internal consistency, we believe the naming and interpretation of the factor to be still somewhat imprecise. In the process of creation of the CIES-SF, we already removed two items that arguably measure self-efficacy beliefs rather than expected outcomes to be more precise. The remaining three items seem to target concerns regarding classroom management (maintaining discipline, giving equal attention to all students) as well as emotional consequences (anxiety, stress), and this subfactor is highly correlated with *Academic Standards* and *Workload*. Future studies could investigate whether this subfactor is reliable and necessary, or could be improved otherwise.

4.4. Summary and conclusion

All in all, the CIES-SF offers many advantages over the original CIES. With only 12 items, the total scale length is reduced by over 42%. Close to perfect correlation (0.96) of the CIES-SF and CIES demonstrates that the use of the short form is much more efficient than the original CIES. Further, subscales are now more concise and distinct, making their interpretation more meaningful. Together with the fact that the factors *Resources, Academic Standards,* and *Workload* were found in many samples from different countries and with different teacher backgrounds, these factors probably represent "core concerns" about inclusive education that potentially apply more generally and are stable across cultures and teaching contexts. The CIES-SF would also be suitable for cross-country comparisons, where it could be informative to contrast teacher samples from different educational systems with different educational policies. However, as mentioned earlier, measurement invariance of the CIES-SF across samples differing in cultural or educational background has yet to be demonstrated. In any case, the CIES-SF is a short and informative scale to assess where teachers might have reservations about inclusive education. We believe the revised short-scale could be a useful resource for researchers, policymakers, and teacher educators to systematically identify genuine concerns that teachers face and address them. The approach could result in addressing a frequently reported gap in our understanding about how to change negative attitudes of teachers toward inclusion.

Declaration of Competing Interest

None.

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