



Validation of the Spanish version of the five-item General Self-Efficacy (GSE) scale in a sample of nursing students: Evidence of validity, reliability, longitudinal invariance and changes in general self-efficacy and resilience in a two-wave cross-lagged panel model

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ABSTRACT

Aim: The aim of this study is to validate the Spanish version of the five-item General Self-Efficacy scale in a sample of nursing students, by: 1) offering evidence of validity and reliability; 2) studying the longitudinal measurement invariance of the scale; 3) providing evidence on the changes in the levels of self-efficacy that occur after one year of nursing education; and 4) offering longitudinal evidence on the relationship between nursing students' self-efficacy and resilience levels.

Background: Nurses' general self-efficacy has been related to both personal and organizational outcomes. In Spain, some competencies the students must acquire during the Degree in Nursing implicitly refer to self-efficacy. For the measurement of general self-efficacy, the General Self-Efficacy Scale is one of the most widely used in Europe.

Design: A longitudinal design was used. Research took place at the University of Valencia and the University of the Balearic Islands (Spain). Participants were 324 nursing students, in the first year of the Nursing Degree.

Methods: The five-item General Self-Efficacy scale and the Brief Resilience Coping Scale were used. Analyses included descriptive statistics, reliability estimates, confirmatory factor analysis, a longitudinal measurement invariance routine and several competing cross-lagged models.

Results: Evidence of reliability shown by the scale was adequate and a one-factor solution for the structure was found. Additionally, the five-item GSE showed evidence of invariance over time. A causal effect of self-efficacy on nursing students' levels of resilience was found.

Conclusions: The Spanish version of the five-item General Self-Efficacy scale is a brief instrument that can contribute to the assessment of some of the basic competencies of the Degree in Nursing, which improve during their education and how these changes are related to other skills important for the nursing profession, such as resilience.

1. Introduction

Albert Bandura has been considered the father of self-efficacy, deriving the concept from his psychological studies (Bandura, 1977).

He defined self-efficacy as the individual's perception of one's ability to perform behaviors through four processes: cognitive, motivational, affective and selection processes (Bandura, 1989). The more self-efficacy we have, the higher our standards (cognition), the more perseverance

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towards them (motivation) we have, the better we manage stress or depression (affect) and the better we select the environments and handle them (selection). Therefore, individuals with higher perceived self-efficacy tend to set themselves higher goals and present higher commitment to achieve them (Bandura, 1984).

Although Bandura (1977) originally described self-efficacy as situation-specific, that is, being related to specific competencies and skills, other theories and definitions of self-efficacy have addressed it as a general construct (Schwarzer et al., 1997; Sherer et al., 1982). For example, Schwarzer et al. (1997) raised the concept of general self-efficacy, as one's overall self-confidence when dealing with challenges in different environments. That is, general self-efficacy refers to a relatively stable and generalized belief that an individual can marshal the resources needed to deal with challenges (Scherbaum et al., 2006).

As such, self-efficacy has been associated with a very wide and varied list of variables and contexts, including chronic pain outcomes (Jackson et al., 2014), goal-based motivation (Bandura, 2013), substance abuse treatment (Kadden and Litt, 2011), or academic performance (Honicke and Broadbent, 2016). Some authors have also argued that cognitive abilities, which would include self-efficacy, could be an inner resource for resilience (Stephens, 2013) and compassion (McGaghie et al., 2002).

1.1. Measurement of self-efficacy

For the measurement of general self-efficacy, researchers have developed several instruments through rigorous psychometric studies (Scholz et al., 2002). Among them, the General Self-Efficacy (GSE) Scale is one of the most widely used in Europe (Scholz et al., 2002).

The GSE Scale (Schwarzer and Jerusalem, 1995) was originally developed in German but has been translated into several languages, including English (Schwarzer and Jerusalem, 1995), Spanish (Schwarzer et al., 1997), Chinese (Schwarzer et al., 1997), Polish (Luszczynska et al., 2005), or Swedish (Löve et al., 2012). This scale is composed of 10 items that are rated on a four-point Likert-type scale, from (1) not at all true to (4) exactly true. The psychometric evidence supporting the GSE scale is sound and positive. In fact, 20 years ago, Scholz et al. (2002) reviewed the research using this measure and reported that the internal consistency coefficients for 25 countries ranged from .75 to .91. This evidence has pointed to a unidimensional factor structure (Scholz et al., 2002). More recently, the scale has been used with adequate psychometric results in Swedish (Lönnfjord and Hagquist, 2018) and Serbian populations (Lazic et al., 2021) and in a sample of Spanish nursing students (Orkaizagirre-Gómara et al., 2020).

From the original version of the GSE, shorter versions have been developed, such as the six-item version (GSE-6; Romppel et al., 2013) and the five-item one (Tamsb and Røysamb, 2014). This latest version of the GSE is widely used in Norway, being employed in the Norwegian Municipal Youth Surveys and the Norwegian mother and child study (MoBa study; Tamsb and Røysamb, 2014). More recently, a study has proved its adequate potential to measure general self-efficacy in a sample of Norwegian adolescents (Steigen et al., 2022).

Although general self-efficacy has been related to important outcomes in nurses (Consiglio et al., 2014; Hsieh et al., 2019; Liu et al., 2018; Xiong et al., 2020) and the GSE scale has been used in some of this research (Liu et al., 2018; Orkaizagirre-Gómara et al., 2020; Xiong et al., 2020), as far as we know, the five-item version of the scale has not been validated in nurses nor in the general Spanish population. Additionally, no evidence of its longitudinal measurement invariance has been provided. The validation of the five-item GSE would enable to use this measurement instrument, in a standardized way, in Spanish-speaking environments. Its longitudinal measurement invariance, if held, would also allow us to monitor nursing students' self-efficacy during the learning process, while also enabling the comparison between scores of students from different courses and centers the scores of students from different courses and centers to be compared.

1.2. Self-efficacy in nurses and nursing students

In the context of nursing, self-efficacy has been related to mental health (Hsieh et al., 2019), burnout (Consiglio et al., 2014), organizational commitment (Chegini et al., 2019), resilience (He et al., 2018), mindfulness (He et al., 2018), or well-being (Liu et al., 2018). Also, studies have reported an indirect relationship between self-efficacy and nurses' anxiety (Simonetti et al., 2021; Xiong et al., 2020). For example, Xiong et al. (2020) have recently found self-efficacy to display buffering capabilities against anxiety in a sample of Chinese nurses during the outbreak of SARS. Indeed, during the COVID-19 outbreak, those nurses with higher levels of self-efficacy have also reported a higher willingness to care for patients with emerging infectious diseases. Additionally, self-efficacy has been associated with nurses' engagement in advance care planning in nursing homes (Gilissen et al., 2020).

When it comes to nursing students, self-efficacy involves the belief that one can reach a goal (Gou et al., 2019). Be that as it may, self-efficacy is more than goal attainment: it is a realistic confidence that one has the skills to meet adversity without causing harm to oneself or others (Hughes et al., 2021). Therefore, self-efficacy is a crucial element for acting independently in the nursing profession (Abdal et al., 2015). The higher the students' self-efficacy, the higher their clinical success (Allari et al., 2020). Among the different variables implied in students' self-efficacy, literature has pointed to instructors' behaviors and beliefs. In this sense, students' self-efficacy can increase through the caring behavior of instructors (Allari et al., 2020). Perceptions of nursing instructors will also increase their educational skills (Cayır and Ulupınar, 2021). Also, nursing students' self-efficacy has been associated with higher achievement motivation (Zhang et al., 2015). Among the specific learning methods to increase self-efficacy, nurses have increased their self-efficacy level through simulation-based learning (Cant and Cooper, 2017; Hung et al., 2021). Sociodemographic characteristics such as gender and age, have also been shown to affect nursing students' self-efficacy levels, although results in this line of research are not clear. On the one hand, Zhang et al. (2015) found greater scores of self-efficacy in male nursing students compared with their female counterparts. On the other hand, Nilsson and Stomberg (2008) and Glossop (2002) had previously suggested that the general self-efficacy scores in female students were higher compared with those of male students. Findings of the effect that age has on self-efficacy are also inconsistent. Orkaizagirre-Gómara et al. (2020) found that nursing self-efficacy, together with perceived competence and resilience, increased with academic level; whereas Chen et al. (2019) found that second-year students had a higher self-efficacy than third-year students.

Regarding nurses' and nursing students' resilience, the existent scientific literature has pointed out a close relationship between it and self-efficacy (Cuartero and Tur, 2021; Stephens, 2013; Walsh et al., 2020; Warszawski, 2022). For example, Stephens (2013) developed a nursing students' resilience model where resilience is the result of the sum of various strengthening protective factors, including self-efficacy as one of the resources that improved nurses' coping. Similarly, Walsh et al. (2020) found in their literature review of resilience practices among nursing students that self-efficacy was one of the main characteristics of resilient behavior. However, other authors have claimed that the relationship between resilience and self-efficacy goes the other way around. For instance, Cuartero and Tur (2021) found that high levels of resilience could increase the levels of self-efficacy. In this same line, Warszawski (2022) found that resilience was a statistically significant predictor of academic self-efficacy. Therefore, although little doubt exists on the relationship between self-efficacy and resilience, research is not clear on the directionality of such a relation, as it has been mostly limited to cross-sectional studies.

In Spain, nurses' undergraduate education in self-efficacy is not implicit, but there are some competencies the students must acquire during the Bachelor's degree in Nursing that refer to it. For example, both the University of Valencia and the University of the Balearic Islands

recognize as a basic competence of the Degree in Nursing that “Students must be able to apply their knowledge to their work or vocation in a professional manner and have to acquire the competencies required for the preparation and defense of arguments and for problem-solving in their field of study” (University of the Balearic Islands, 2022; University of Valencia, 2022). This competence is clearly related to the nurses’ self-efficacy which, as defined by Schwarzer and Jerusalem’s (1995), is paramount to decision-making tasks when in trouble or when dealing with problems.

1.3. Aims of the study

The present study has several aims. Firstly, to present evidence of validity and reliability of the Spanish version of the five-item GSE scale in a sample of nursing students. Secondly, to study the longitudinal measurement invariance of the scale, so as to guarantee its future use in longitudinal studies aiming to monitor nursing students’ self-efficacy levels over time. Thirdly, the study aims to offer evidence of changes in the levels of self-efficacy after one year of nursing education. Finally, the fourth aim was to provide longitudinal evidence on the relationship between nursing students’ self-efficacy and resilience levels.

2. Methods

2.1. Study design

A longitudinal design was used. Data were gathered during May 2022 and 2023.

2.2. Setting and participants

For the first wave (May 2022), students of the Nursing Degree from the University of Valencia and the University of the Balearic Islands (Spain) were encouraged to participate through the list of students. To be included, participants had to be nursing students in the first year of the Bachelor’s degree in Nursing. These same students were contacted one year later and were invited to participate in the second wave (May 2023). On both occasions, the students filled out an online survey which was around 20 long, approximately.

To determine the required sample size in Wave 1, the total population of the first year of the Degree in Nursing at both universities was considered. For a population that was calculated to be $N = 432$, with a confidence interval of 95% and an error limit of 5%, the number of elements to obtain was $n = 204$.

2.3. Measures

The five-item GSE scale (Tambs and Røysamb, 2014) is formed by five items that assess general self-efficacy. As these five items were extracted from the original ten-item version (Schwarzer and Jerusalem, 1995), we extracted the five corresponding items from the Spanish ten-item version of the GSE scale (Schwarzer et al., 1997). The five-item GSE has four response categories: not at all true (1), hardly true (2), moderately true (3) and exactly true (4). For the total score, a mean score of the five items needs to be calculated. The resulting Spanish version of the scale can be consulted in Supplementary material Table 4.

Together with sociodemographic characteristics, the Brief Resilience Coping Scale (BRCS; Sinclair and Wallston, 2004), in its Spanish version (Tomás et al., 2012) was used. Its items describe an effective, active problem-solving coping pattern that reflects a resilient coping behavior tendency. An example of its items could be “I look for creative ways to alter difficult situations” (item 1) or “I actively look for ways to replace the losses I encounter in life” (item 4). Items are scored on a four-point Likert-type scale, from 1 (not at all true for me) to 4 (very true for me). The total score is the mean of the four items in the scale. Reliability estimates in this sample were .742 for Wave 1 (May 2022) and .867 for Wave 2

(May 2023).

2.4. Data analysis

Firstly, descriptive and reliability statistics for the items and the total score of the Spanish version of the five-item GSE scale in time 1 (May 2022) were calculated. These included the mean, standard deviation, minimum and maximum scores and internal consistency estimates for the items (homogeneity and alpha if item deleted) and the scale (Cronbach’s alpha and McDonald’s omega). The Average variance extracted (AVE) was also calculated. The average variance extracted reflects the amount of variance in the indicators that is accounted for by the latent constructs. For reliability estimates, values of 0.70 were considered adequate (McNeish, 2018); for the AVE, a cut-off point of 0.50 was used, attending to the criteria reported by Fornell and Larcker (1981).

Secondly, for the study of the internal structure, a confirmatory factor analysis was hypothesized, estimated and tested in data from Wave 1. The hypothesized model was comprised of one factor of general self-efficacy which explained the five items of the scale. To assess the model fit, several criteria were used: the chi-square statistic, the Comparative Fit Index (CFI), the Standardized Root Mean Square Residual (SRMR) and the Root Mean Square Error of Approximation (RMSEA). CFI and TLI values above .90 (better over .95) and SRMR and RMSEA values below .08 (better under .06) were indicative of a good fit (Hu and Bentler, 1999; Perry et al., 2015).

Once reliability and validity evidence were gathered, longitudinal measurement invariance of the Spanish version of the five-item GSE across time was tested by means of confirmatory factor analysis. In this approach, a hierarchical set of models specifying increasingly restricted models was employed to assess longitudinal invariance (Millsap and Yun-Tein, 2004). First, a unidimensional confirmatory factor analysis was also estimated for time 2, to test equal factor structure over time. If the model holds, a *configural or unconstrained model* is evaluated. This model imposes no equality constraints on parameters and provides a baseline model form comparing the more restrictive models (Byrne, 2012). The *metric or weak model* is nested to the configural model and examines the extent to which the magnitude of item factor loadings change over time (Brown, 2006). Finally, the *scalar or strong model* tests for the evidence that thresholds (intercepts) for the items are invariant over time (Brown, 2006).

Longitudinal measurement invariance was considered true when, after imposing the described constraints, the model did not worsen. Such worsening of the nested models was evaluated by χ^2 difference test (using the DIFFTEST option in Mplus), together with the comparison of CFI (Δ CFI) and RMSEA (Δ RMSEA) values of the alternative models. Cut-off values of -0.010 for Δ CFI and $.015$ for Δ RMSEA were used (Chen, 2007).

For the estimation of the successive confirmatory factor analyses the weighted least square mean and variance-corrected (WLSMV) estimation method was used, according to the ordinal nature of the data and its non-normality (Flora and Curran, 2004; Muthén and Muthén, 2017).

Finally, we studied the causal relation between general self-efficacy, as measured with the Spanish version of the five-item GSE and resilience. For this purpose, we first compared nursing students’ levels of self-efficacy and resilience between Wave 1 and Wave 2. Means were compared using *t*-tests for repeated measures. To determine the effect size, Cohen’s *d* for repeated measures was calculated. The interpretation of effect sizes was $d=0.20$ for small, $d=0.50$ for medium and $d=0.80$ for large, based on benchmarks suggested by Cohen (1988). Then, we hypothesized, estimated and assessed several competing cross-lagged models to test the direction and strength of the link between self-efficacy and resilience: a) the stability model, which only contained the autoregressive effects; b) the self-efficacy model, which added a path from T1 self-efficacy to T2 resilience; c) the resilience model, which added a path from T1 resilience to T2 self-efficacy; and d) the reciprocal

causality model, which contained bidirectional relationships between self-efficacy and resilience. Due to sample size limitations, general self-efficacy and resilience, both in T1 and T2, were included as overall scores (observed variables). In all the models, gender and age were introduced as control variables. Models are displayed in Fig. 1.

To assess the model fit, the indices mentioned above were used, together with an examination of the relations in the model.

For the statistical analyses, SPSS version 26 (IBM Corp, 2019) and Mplus version 8.4 (Muthén and Muthén, 2017) were used.

2.5. Ethical considerations

The study was approved by the Ethics Research Committee of the University of the Balearic Islands (263CER22) and the Ethics Committee in Experimental Research of the University of Valencia (2581819). Students participated voluntarily and anonymously and signed an informed consent form.

3. Results

The complete sample in Wave 1 (May 2022) was composed of 324 nursing students. 84.0% were women. Mean age was 22.61 (SD=7.22) years old. 51.9% were University of Valencia students and 48.1% were University of the Balearic Islands students. Most students were not working at the time of the survey (70.7%). 14.5% were working as healthcare professionals. For more details, see Table 1.

Descriptive statistics for the Spanish version of the five-item GSE can be consulted in Table 2. Item 4 (“I can remain calm when facing difficulties because I can rely on my coping abilities”) was the one with the lowest mean, whereas item 1 (“I always manage to solve difficult problems if I try hard enough”) presented the highest one. Levels of general self-efficacy of the sample were medium-high, as the mean score in general self-efficacy was 2.878, above the midpoint of the scale. The reliability coefficients of the scale were also adequate, with $\alpha=0.708$ and $\Omega=0.776$. The average variance extracted, in turn, showed a value of .411 and therefore it did not meet the 0.50 cut-off criteria. However, according to Fornell and Larcker (1981), the AVE may be a more conservative estimate of the validity of the measurement model and “on the basis of p_n (composite reliability) alone, the researcher may conclude that the convergent validity of the construct is adequate, even though more than 50% of the variance is due to error” (p. 46). Because of its conservative nature, together with the adequate values of alpha and omega, indicators were considered reliable and valid.

Items’ evidence of reliability showed adequate estimates of item-total correlations and reliability: item-total correlations were in the range of .627 to .724, above the acceptable minimum of .30 (Nunnally and Bernstein, 1994) and the removal of any of the items supposed a decrease in the reliability estimate of the scale (see Table 2).

The confirmatory factor analysis tested showed an excellent overall fit: $\chi^2(5)=25.199$ ($p<0.001$), CFI=0.961, TLI=0.921, SRMR=0.038; except for RMSEA=0.114, 90% CI [0.072,0.160]. However, RMSEA has shown poor performance in structural models with few degrees of freedom (Kenny et al., 2015), as in this case. Regarding the analytical fit, statistically significant factor loadings were found ($p<0.001$), ranging from .552 (item 2, “If someone opposes me, I can find the means and ways to get what I want”) to .719 (item 3, “I am confident that I could deal efficiently with unexpected events”) (see Table 2). In sum, the model was considered an adequate representation of the data.

To test the longitudinal measurement invariance, students were surveyed one year later, in May 2023. 91 students responded to the survey. 86.8% were women. Mean age was 23.09 (SD=6.43). 61.5% were University of the Balearic Islands students, whereas 38.5% were University of Valencia students. Most of the students were not working at the time of the survey (71.4%). 13.2% were working as healthcare professionals.

Results of the longitudinal measurement invariance routine showed

an adequate fit of the one-factor model in both Wave 1 and Wave 2. Once evidence on the two timeframes was gathered, the second step in assessing longitudinal measurement invariance was to establish a well-fitting baseline model (configural invariance), with no constraints. The configural model demonstrated adequate fit and therefore it was used as the basis for testing more constrained models. Thirdly, the metric model was tested, where factor loadings were constrained to be equal over time. This model did not present statistically significant differences from the configural model ($\Delta\chi^2=6.443$, $\Delta df=4$, $p=.168$) and showed no substantial worsening of model fit ($\Delta CFI=-0.002$; $\Delta RMSEA=0.001$). Next, intercepts were constrained to be equal over time. Scalar invariance was evinced as, again, the model did not present statistically significant differences from the metric model ($\Delta\chi^2=13.046$, $\Delta df=9$, $p=.161$) and showed no substantial worsening of the model’s fit ($\Delta CFI=-0.002$; $\Delta RMSEA=0.004$). Thus, the Spanish version of the five-item General Self-Efficacy scale demonstrated longitudinal measurement invariance in Spanish nursing students.

Finally, we studied the relation between general self-efficacy and resilience over time. For this purpose, we assessed nursing students’ levels in these variables both in Wave 1 and Wave 2. As can be seen in Table 2, levels of general self-efficacy and resilience were high, as they were around the score of 3 in the two waves. Additionally, a statistically significant increase of medium size according to Cohen’s benchmarks was observed from Wave 1 to Wave 2, in both self-efficacy ($t(87)=5.107$, $p<0.001$, $r=0.556$, Cohen’s $d=0.544$ [95%CI=0.319,0.757]) and resilience ($t(87)=4.353$, $p<0.001$, $r=0.434$, Cohen’s $d=0.464$ [95%CI=0.243,0.683]) levels.

Regarding the results of the cross-lagged panel models, we found a poor fit for the stability model or model a) and for the resilience model or model c). Models b) and d) offered an excellent fit (see Table 3). As they were nested models, they were compared by χ^2 difference test, showing no statistically significant differences ($\Delta\chi^2=0.139$, $\Delta df=1$, $p=.709$). Additionally, the comparison of CFI (ΔCFI) and RMSEA ($\Delta RMSEA$) showed no differences between models. Therefore, the most parsimonious model, that is, model b) or self-efficacy model, was retained as the best representation of the data.

Regarding the analytical fit of the self-efficacy model, the control variables showed no statistically significant effects except for the relation between gender and resilience, with higher levels of resilience for men. Self-efficacy and resilience levels were statistically correlated in both Wave 1 and Wave 2. Most importantly, when controlling for prior levels of resilience, Time 1 level of general self-efficacy predicted Time 2 resiliency levels ($\beta=0.427$, $p<0.001$). The details can be consulted in Fig. 2.

4. Discussion

This study aimed at validating the Spanish version of the five-item GSE scale in a sample of nursing students, while offering evidence of its longitudinal invariance, the change produced in students’ self-efficacy after one year of nursing education and also to provide longitudinal evidence on the relationship between nursing students’ self-efficacy and resilience levels.

To succeed in our first aim, the validity and reliability of the Spanish version of the five-item GSE scale in a sample of nursing students were gathered. The scale showed evidence of good internal consistency and reliability, although evidence of validity according to the AVE was poor. At item level, all items showed adequate estimates for reliability and homogeneity. Values were similar to those obtained in the Norwegian version (Steigen et al., 2022). Additionally, the five-item GSE scale showed a unidimensional structure, meaning there is a general factor of general self-efficacy that explains the five items of the scale. This finding is in line with previous research carried out with the original 10-item GSE scale (Scholz et al., 2002) and with the more recent studies done with the five-item version (Steigen et al., 2022; Tambs and Røysamb, 2014).

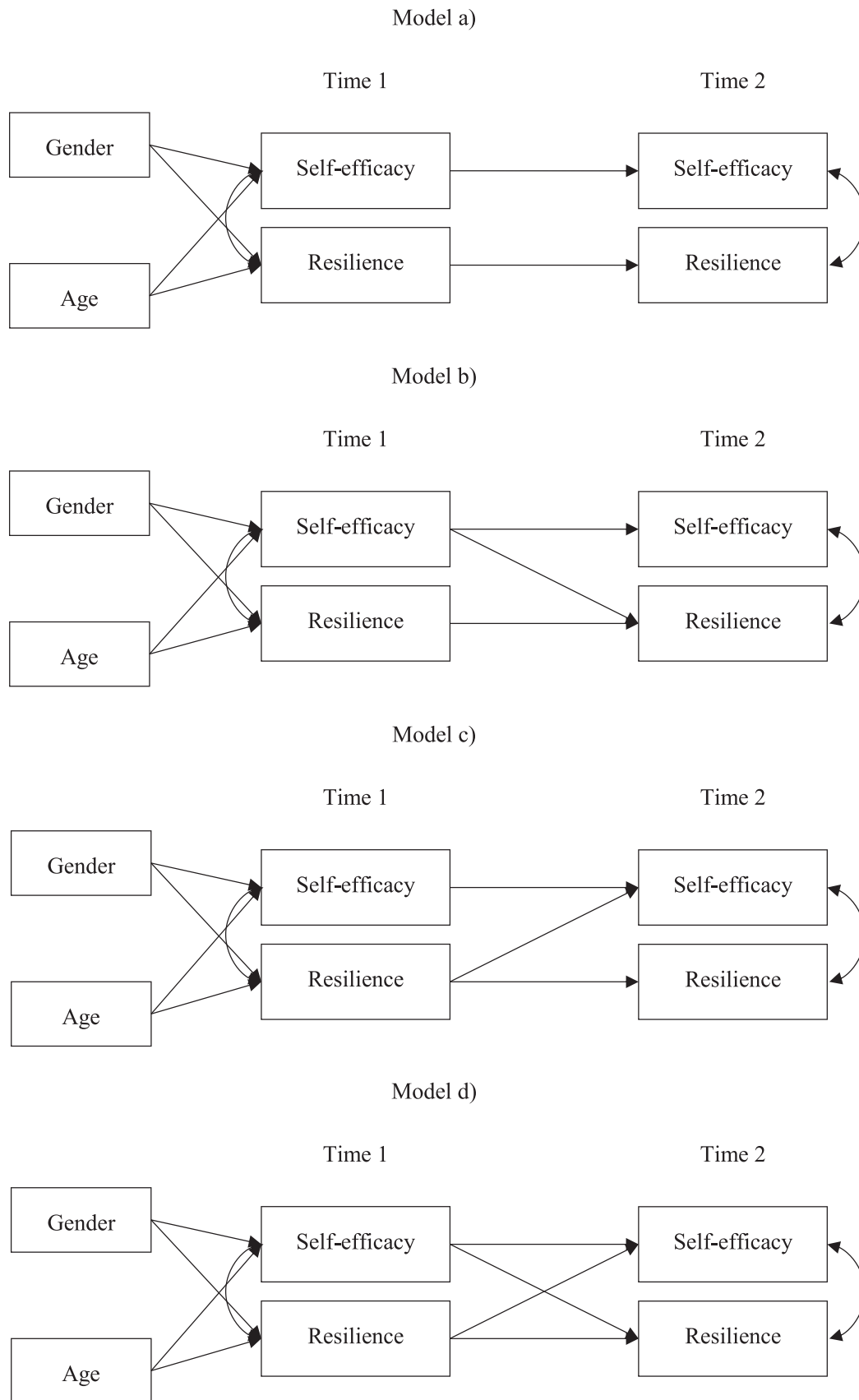


Fig. 1. Competitive cross-lagged models to test the relationships between self-efficacy and resilience.

Table 1
Sample description.

Variable/groups	M	SD
Age	22.61	7.22
Sex	n	%
Women	272	84.0
Men	51	15.7
Missing	1	0.3
University		
University of Valencia	168	51.9
University of the Balearic Islands	156	48.1
Missing	0	0.0
Job		
Not job	229	70.7
Part-time job	44	13.6
Full-time job	51	15.7
Missing	0	0.0
Healthcare professional		
No	277	85.5
Yes	47	14.5
Missing	0	0.0

Notes: M = mean; SD = standard deviation.

The second aim of the present research was to study the longitudinal measurement invariance of the scale. For this purpose, a hierarchical set of models specifying increasingly restricted models was employed. The scale showed evidence of scalar invariance, which is an important prerequisite for change estimation (Widaman et al., 2010). This equivalence of the general self-efficacy construct over time, as assessed by the GSE, has been previously demonstrated in its 10-item version in German adolescents (Grevenstein and Bluemke, 2017), Serbian undergraduate students (Lazić et al., 2021), or Turkish university students (Akin-Arikan, 2021). However, it is the first time, as far as we know, that evidence of this kind is provided for the five-item version, in the Spanish population and in nursing students. Therefore, the results of current research point to the adequacy of the Spanish version of the five-item

GSE scale for assessing changes in nursing students' self-efficacy, whether they are caused by educators' behaviors and methodology interventions (Allari et al., 2020; Cant and Cooper, 2017; Hung et al., 2021), or by the acquisition of competencies and skills that is expected to occur in the course of the Degree of Nursing (University of the Balearic Islands, 2022; University of Valencia, 2022).

As regards the third aim of the study, which was to offer evidence on changes in the levels of self-efficacy after one year of nursing education, results pointed to an increase in the self-efficacy levels, together with resilience scores. These results showed that nursing students learn to better think of solutions when in trouble or in front of problems after one year of education, which is a necessary competency to become a nurse (University of the Balearic Islands, 2022; University of Valencia, 2022). Indeed, nursing students' self-efficacy is a predictor of their performance in clinical settings (Alosaimi, 2021) and therefore it is a cornerstone for providing high-quality care (George et al., 2020).

Our fourth and final aim was to provide longitudinal evidence on the relationship between nursing students' self-efficacy and resilience levels. For this purpose, we compared several competing cross-lagged models to test the direction and strength of the link between self-efficacy and resilience, while controlling for the effect of gender and age. No effects of gender or age on self-efficacy were found and only gender showed a positive effect on resilience. Regarding the relationship between self-efficacy and resilience, our results pointed out that the best fitting model was the self-efficacy model, where, together with the autoregressive effects, a path from T1 self-efficacy to T2 resilience was added. That is to say, self-efficacy can be considered the base from which nursing students improve their resilience, an ability that has been related to nursing students' academic success, perseverance and the dropout rate (Hwang and Shin, 2018; Van Hoek et al., 2019) and enables future nurses to positively adapt to stressors and adversity (Cooper et al., 2020) while reducing psychological harm and increasing well-being (Cooper et al., 2021).

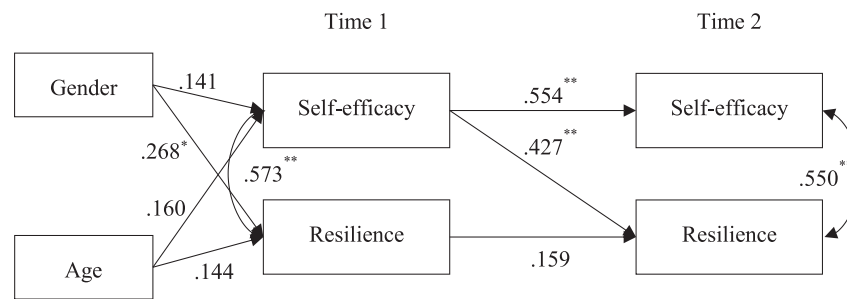
Table 2
Descriptive statistics.

Variable	M	SD	Min	Max	Sk	K	λ	Item-total r	α _{iid}
Items and scale statistics of the Spanish version of the five-item GSE (n= 324)									
1	3.000	0.628	1.00	4.00	-0.315	0.569	0.594	0.639***	.674
2	2.871	0.651	1.00	4.00	-0.150	-0.006	0.552	0.627***	.683
3	2.894	0.681	1.00	4.00	-0.111	-0.266	0.719	0.724***	.634
4	2.647	0.791	1.00	4.00	0.082	-0.557	0.655	0.720***	.658
5	2.981	0.634	1.00	4.00	-0.138	-0.024	0.673	0.689***	.649
Total score	2.878	0.461	1.60	4.00	0.118	0.182	—	—	—
Descriptive statistics for general self-efficacy and resilience in the two waves (n= 91)									
General self-efficacy in Time 1	2.91	0.48	1.80	4.00	0.291	-0.189	—	—	—
General self-efficacy in Time 2	3.17	0.52	1.80	4.00	-0.318	-0.270	—	—	—
Resilience in Time 1	2.85	0.49	1.75	4.00	0.253	-0.345	—	—	—
Resilience in Time 2	3.13	0.59	1.00	4.00	-0.764	1.047	—	—	—

Notes: M= mean; SD= standard deviation; Min= minimum score; Max= maximum score; Sk= skewness; K= kurtosis, α_{iid}= alpha if item deleted; ***p<0.001.

Table 3
Results of the structural equation models.

	χ ²	df	p	CFI	TLI	RMSEA [90% CI]	SRMR	Δχ ²	Δdf	p	ΔCFI	ΔRMSEA
Results of the longitudinal measurement invariance routine												
CFA in wave 1 (n=91)	15.250	5	0.009	0.954	0.909	0.153[0.069,0.243]	0.073	—	—	—	—	—
CFA in wave 2 (n=91)	14.079	5	0.015	0.981	0.962	0.142[0.057,0.232]	0.053	—	—	—	—	—
Configural	50.872	31	0.014	0.978	0.968	0.084[0.039,0.125]	0.059	—	—	—	—	—
Metric	56.467	35	0.012	0.976	0.970	0.083[0.039,0.121]	0.060	6.443	4	0.168	-0.002	0.001
Scalar	67.997	44	0.012	0.974	0.973	0.078[0.037,0.113]	0.064	13.046	9	0.161	-0.002	0.004
Results of the competitive cross-lagged models												
(a) stability model	20.591	6	0.002	0.890	0.744	0.164[0.090,0.245]	0.134	—	—	—	—	—
(b) self-efficacy model	1.943	5	0.857	1.000	1.000	0.000[0.000,0.079]	0.025	—	—	—	—	—
(c) resilience model	18.156	5	0.003	0.901	0.723	0.171[0.091,0.259]	0.093	—	—	—	—	—
(d) reciprocal model	2.147	4	0.709	1.000	1.000	0.000[0.000,0.118]	0.021	—	—	—	—	—



Notes: * $p < .010$; ** $p < .001$.

Fig. 2. Cross-lagged relationships between general self-efficacy and resilience of the self-efficacy model. Notes: * $p < .010$; ** $p < .001$.

4.1. Limitations

This research has some limitations. The main one is the attrition rate in Wave 2. The fact that the initial sample, which was representative of the population, was reduced by more than half makes the results presented here harder to generalize. Indeed, this small sample size prevents us from testing more complex longitudinal models, by incrementing the number of control variables or modeling general self-efficacy and resilience as latent factors. In this same line, the small representation of men could also have affected results regarding the effect of gender. Future research addressing these shortcomings would be of great importance to the topic.

5. Conclusions

Nurses' and nursing students' general self-efficacy has been related to both personal (i.e., motivation, mental health, well-being) and organizational outcomes (i.e., burnout, willingness to care for patients, engagement in planning). As such, it is recognized as a basic competency by the plans of study used in the Degrees in Nursing at Spanish Universities. Its assessment is important both for the education process and the future nurses in practice. The Spanish version of the five-item GSE has offered evidence of validity and reliability and, therefore, could be effective in evaluating Spanish undergraduate nursing students' general self-efficacy. It has also offered evidence of longitudinal invariance, which will allow educators to assess changes in nursing students' self-efficacy during their education, changes that are expected to happen. In fact, current research has offered, for the first time, changes in nursing students' self-efficacy after one year of nursing education. And, last but not least, self-efficacy has proven to be an important predictor of resilience, which itself has been defined as a key ability for both nursing students and professional nurses. The more confident our students are in their competencies and abilities to solve problems; the better resilience practices they will build.

In sum, the Spanish version of the five-item General Self-Efficacy scale is a brief instrument that can contribute to the assessment of some of the basic competencies in the Degree in Nursing, which improve during education and how these changes are related to other skills important for the nursing profession, such as resilience.

Ethical considerations

The study was approved by the Ethics Research Committee of the University of the Balearic Islands (263CER22) and the Ethics Committee in Experimental Research of the University of Valencia (2581819). Students participated voluntarily and anonymously, and signed an informed consent.

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CRedit authorship contribution statement

Laura Galiana and Noemí Sansó conceived and designed the study; Noemí Sansó collected the data, Laura Galiana and Javier Sánchez analyzed and interpreted the data, All authors wrote and reviewed the manuscript.

Declaration of Competing Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Appendix A. Supporting information

Supplementary data associated with this article can be found in the online version at [doi:10.1016/j.nepr.2023.103865](https://doi.org/10.1016/j.nepr.2023.103865).

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