



CAPTURING TEACHER BASIC NEEDS SATISFACTION: VALIDATION EVIDENCE FOR THE GREEK SCALE MEASURING PE TEACHERS' BNS

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Abstract:

According to self-determination theory, teachers' basic needs satisfaction is essential for the quality of their motivation, teaching, and work behavior. Considering the lack of valid and reliable instruments measuring teachers' basic needs satisfaction (for autonomy, competence and relatedness) within the Greek context, we evaluated the factorial validity and internal consistency for the Greek version of the Basic Needs Satisfaction Scale for Teachers (BNSST; Longo et al., 2016). Standard back-translation procedures were followed. Focusing on Physical Education (PE) teachers, the validity of the measure was evaluated via two cross-sectional studies with samples of pre-service (n=109; study 1) and in-service (n=91; study 2) teachers. The psychometric properties of the instrument were established through exploratory and confirmatory factor analysis, Cronbach's alphas, and latent variables' associations with external criteria. In both studies, factor analyses results supported the construct validity of the 9-item, 3-correlated factors model, producing satisfactory goodness of fit indices, suggesting that the three needs are positively related with each other. Internal consistency analysis produced acceptable values for all the scales of the study. In line with theoretical assumptions and past research evidence, latent variables correlations with external criteria showed that basic needs satisfaction connects positively with their beneficence, cooperation willingness, intrinsic motivation and identified regulation. Furthermore, structural equation modeling revealed a positive connection between teachers' general basic needs satisfaction and their autonomous motivation, work engagement, and work satisfaction, suggesting that the fulfillment of teacher basic needs can positively predict their well-being at work. The present findings suggest that the BNSST-GR has good psychometric properties and provide initial support for the instruments' validity and reliability. Such

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measurements may prove useful in examining Greek teachers' basic needs satisfaction in a variety of work-related contexts (e.g., teacher professional development).

Keywords: teachers' basic needs satisfaction, PE teachers, PE teacher training education, self-determination theory, instrument validation

1. Introduction

Basic psychological needs theory postulates that human beings possess innate psychological needs for autonomy, relatedness and competence, which energizes and directs their behavior (Deci & Ryan, 2000). Autonomy need, involves a sense of volition, experiencing a sense of choice and perceiving one's behavior as freely chosen, rather than controlled by external forces. Competence need, involves feeling effective in one's activities, and capable of mastering challenges and attaining desired outcomes. Relatedness (or belongingness) need consists of feeling of closeness and connected to others, caring for and feeling cared for by others. SDT posits that the satisfaction of these innate psychological needs provides the nutrients (fuels) for autonomous motivation and optimal well-being (Ryan & Deci, 2000). In line to theoretical propositions, empirical research evidence support that in order individuals to achieve high levels of self-determined motivation (i.e., intrinsic, identified) and well-being in various life domains (such as education, training, work), these psychological needs must be satisfied (Deci & Ryan, 2008; Vansteenkiste, Ryan, & Deci, 2008).

For example, in the work domain, across different countries and professions, basic needs satisfaction has been connected positively with greater job satisfaction, work engagement, autonomous motivation, willingness to participate in training, and well-being (e.g., Baard, Deci, & Ryan, 2004; Deci et al., 2001; Richer Blanchard, & Vallerand, 2002; Vansteenkiste, De Witte, & Lens, 2006). In similar vein, in the context of teaching, basic needs satisfaction has been linked to teacher autonomous motivation to participate in innovative school projects (Schellenbach-Zell & Gräsel, 2010), and teacher perceptions of school environment being supportive towards their basic needs have been found to predict teacher autonomous motivation, and persistence to implement new teaching approaches (Lam, Cheng & Choy, 2010).

Reliable and valid measurement tools are fundamental for conducting solid social research and by all means, contextual specificity should be taken into consideration in motivation research (Vallerand, 1997). However, within the Greek context there is a lack of valid and reliable instruments measuring teachers' and PE teachers' basic needs satisfaction. In the absence of adequate contextual and situational specific measures, more general domain measures can be modified/adapted to examine specific samples and situations. However, BNS relevant research suggests that when applied in dissimilar contexts, there might be issues regarding the dimensionality of the measure, as the factor structure of a scale may vary (Johnston & Finney 2010). Therefore, in the present study, we chose to adapt and validate a recently developed short instrument which was

originally developed and exhaustively validated in the field of education and work by Longo and colleagues (2016), demonstrating superior validity-reliability compared to previously used scales, such as BNS at Work Scale (Deci et al., 2001) and Balanced Measure of Psychological Needs (Sheldon & Hilpert, 2012). As suggested by these researchers, this new instrument wording and item selection overcomes issues of current BNS scales including items measuring need-supportive conditions rather than need satisfaction; and resolves possible issues created by negatively-worded items, ambiguous items and items taping on antecedents of need satisfaction rather than need satisfaction (Longo, Gunz, Curtis, Farsides, 2016).

Therefore, the purpose of the present study was to evaluate the factorial validity and internal consistency of the Greek version of the Basic Needs Satisfaction Scale for Teachers (BNSST; Longo et al., 2016). Here we report findings from two cross-sectional studies, aiming to validate a brief but psychometrically sound measure of Teachers' Basic Needs Satisfaction that could potentially be applied across diverse situations and contexts, such as Physical Education Teacher Education (PETE), in-service training and professional development. This study was a part of a broader research project regarding PE teachers' professional development and has served as the validation study of the instrument that assesses teacher innate needs satisfaction as defined by Self Determination Theory.

The main research question guiding our study was "what are the relationships between teachers' basic needs satisfaction, their motivation and well-being at work and professional training?". Drawing upon theoretical propositions and empirical evidence it was expected that teachers' basic needs satisfaction will exhibit a theoretically justifiable pattern of relationships and will connect positively with autonomous motivation and variables corresponding to work-related well-being such as teacher sense of beneficence, willingness to cooperate with colleagues, work satisfaction, and work engagement.

We have chosen to focus on these external criteria, because to our knowledge there is a lack of relevant studies examining these variables in the Greek education context. In addition, recently, teacher learning has shifted the focus from emphasizing on individual reflective practice to collaborative systematic inquiry (Borko, 2004; Opfer & Pedder, 2011). The educational sector confronts an increasing pressure towards collaboration: teachers need to be proficient collaborators in order to successfully perform their job. Numerous studies have underlined the advantages of engaging in teacher collaboration. (Reeves et al., 2017; Vangrieken et al., 2015). Therefore, we decided to focus on teacher motivation to collaborate with peers, as reflected by their willingness to cooperate as an important outcome of their basic need satisfaction. In addition, with regard to Beneficence, which is a recently developed construct by Martela & Ryan, (2016a, 2016b) it reflects the personal sense of having done good things benefitting others. It is the sense of being able to give and having a positive impact on others and is considered to inherently improve well-being (see Martela & Ryan, 2020 for an overview). This variable seemed quite relevant to our study, because recent evidence suggests that beneficence satisfaction consistently present a significant positive relationship with basic needs

satisfaction and could serve as a criterion variable. Furthermore, according to SDT and relevant research, basic needs satisfaction is closely connected with individuals' autonomous motivation and well-being in various life domains (see Deci & Ryan, 2008, for an overview). Research shows that well-being at work has been systematically reflected upon variables such as work satisfaction and work engagement (Bakker & Oerlemans, 2011), and SDT relevant research shows significant positive connections between needs satisfaction and these constructs (e.g., Van den Broeck et al., 2010). Therefore, we focused on the aforementioned variables as external criteria for the evaluation of BNS instruments' validity.

2. Study 1: Pre-service PE teachers

2.1 Material and Methods

2.1.1 Participants

Prior to the study, approval from the ethics committee of the authors' university was obtained. Participants responded in self-administered, paper-pencil questionnaires, voluntarily and anonymously. The sample of this study were 109 (69 males, 40 females) PE pre-service teachers (final year undergraduate students), 21.7 ± 3.1 years old (from 19 to 38), participating in the school practicum module during their studies at the Department of Physical Education and Sport Science of the University of Thessaly. This context was chosen because during their participation in the practicum module, pre-service teachers have the opportunity to cultivate their teaching skills through collaborative tasks, in a real-life work setting, at the school yard environment.

2.1.2 Procedure

After a standard back-translation procedure for the development of the Greek version of the scales, the instrument was adapted for the PETE context of the practicum module. This process was conducted by three experts in the field of teachers' motivation and SDT theory. The original 18-item instrument is comprised of six subscales with three items per need satisfaction and frustration. In the present study we only used nine of the need satisfaction items.

2.1.3 Instruments

a. Basic Need Satisfaction Scale (Longo et al., 2016)

This 7-point likert type scale (1/strongly disagree-7/strongly agree) comprises three subscales with three items per scale, reflecting teachers' basic needs for autonomy, competence and relatedness satisfaction. Following the stem "During my practicum module at school..." participants responded in the items of Table 1.

b. Beneficence scale (Martela & Ryan, 2016a, 2016b)

This scale assesses the subjective sense of pro-social impact. Beneficence was measured with three items and pre-service teachers responded about their subjective feeling of having done good things benefitting their peers/colleagues. Following the stem "Think

how you felt during the practicum module" participants responded to items as "The things I do contribute to the betterment of my peers/colleagues", on a 7-point Likert type scale (1/strongly disagree - 7/strongly agree).

c. Cooperation Willingness scale (Campion et al., 1983; Scott et al., 2003)

This 5-point Likert type scale (1/strongly disagree - 5/strongly agree) consisted of three items reflecting teachers' willingness to cooperate with their colleagues during their participation in the practicum module. Following the stem "During my participation at practicum module..." participants responded to items such as "I am willing to share information with my peers/colleagues".

2.1.4 Analytical Approach-Statistics

Construct validity evaluated following a within- (i.e., factors analysis & correlation patterns) & between-network (i.e., correlation patterns with external criteria) approach (Marsh, 1998). All analyses were conducted with the IBM SPSS & AMOS version 24 statistical package. Specifically, Exploratory Principal Component Factor Analysis (EFA-PCA; Data driven) and Confirmatory Factor Analyses were conducted using maximum likelihood estimation method (CFA; Theory driven). Cronbach's α were calculated. Further, latent variables' associations with external-criteria variables were computed.

2.2 Findings of Study 1

2.2.1 Construct Validity-Internal Consistency

To test for the dimensionality of the scales and to examine whether the three needs were psychometrically independent in our data we conducted an EFA-PCA. This analysis showed that the 3-factor solution was the one explaining the largest amount of total variance which was about 66.6 %, retaining the three individual factors that all had significant explanatory power, with eigenvalues over 1 (Table 1). Cronbach's α of each scale were satisfactory (>.67; see Table 3).

Table 1: EFA - Principal Component Analysis, pre-service teachers (N=109)

Pattern Matrix	Component		
	Autonomy	Competence	Relatedness
Scale ITEMS (<i>During my practicum module at school...</i>)			
I feel I'm given a lot of freedom in deciding how I do things.	.845		
I feel completely free to make my own decisions.	.813		
I feel free to decide what to do.	.783		
I feel I am very good at the things I do		.686	
I feel highly effective at what I do		.772	
I feel I can accomplish even the most difficult tasks.		.825	
I feel the people I interact with really care about me.			.838
I feel I'm perfectly integrated into this group.			.858
I feel very close and connected with other people.			.601
Eigenvalues >1	3.45	1.52	1.02
% of Variance	38.33	16.86	11.38
Total % Variance extracted: 66.57			
Rotation Method: Oblimin with Kaiser Normalization. Converged in 5 iterations.			

Next, to confirm the construct validity of the instrument we conducted a CFA. In order to assess the model-fit we emphasized a combination of goodness-of-fit indices, which are commonly-used in the literatureⁱⁱ. The results showed that the model reflects an excellent fit to the data, supporting the validity of the 9-item, 3-correlated factors model (for goodness of fit indices see Table 2, model 1). In addition, as expected, correlation inspection supported our hypotheses showing that all three needs were significantly positively related with each other ($r > .40$, $p < .05$; Table 3).

2.2.2 Convergent and Discriminant Validity

Convergent and discriminant validity of the constructs was established via examination of latent factors' associations in the full measurement model; whereby, all the scales of the study were tested simultaneously in a single model. Due to the multidimensional nature of the BNS measure, this approach allows to confirm concurrently both the between and the within-network independence of constructs. So, external-criterion construct validity was evaluated through the relationships of the *Basic Needs Satisfaction* with *Beneficence* and *Willingness* to cooperate variables. As hypothesized, it emerged that teacher basic needs satisfaction are positively related to their sense of beneficence and willingness to cooperate with colleagues (see Table 2 model 2, Table 3 & Figure 1).

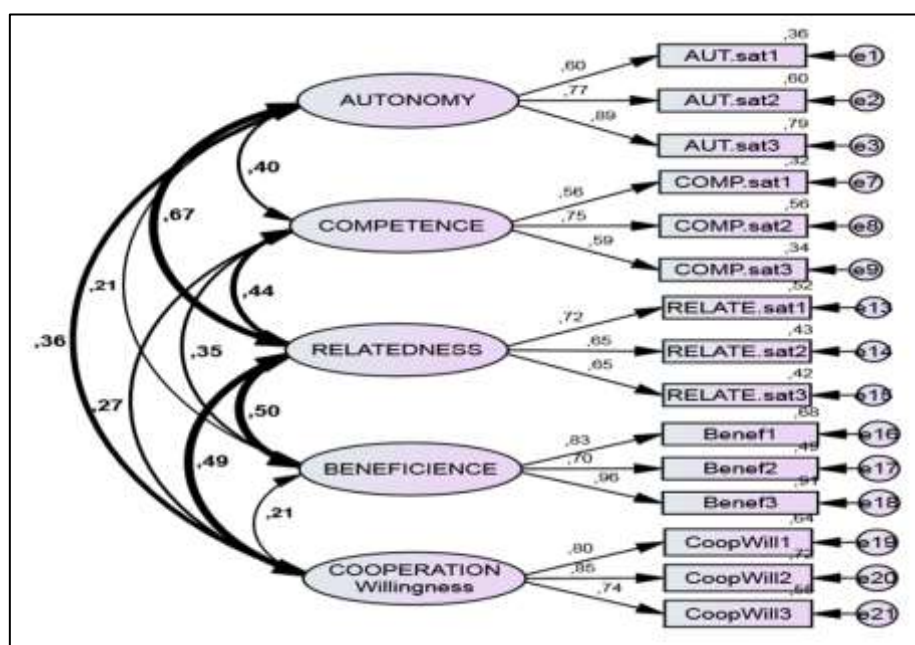


Figure 1: Full CFA, depicting relations between pre-service teachers' basic needs satisfaction, beneficence and willingness to cooperate with peers/colleagues

ⁱⁱ CFI (comparative fit index) and TLI (Tucker-Lewis index) values $> .90$ indicating a good fit, and $> .95$ reflecting an excellent fit; SRMR (Standardized root mean squared residual) values $< .08$ suggest a good fit (Hu & Bentler, 1999); RMSEA (Root Mean Square Error of Approximation) values $< .05$ indicating a close fit, whereas values up to $.08$ considered as reasonable (Marsh, Balla, & Hau, 1996). Normed χ^2 (i.e., χ^2/df) values < 2 or even as high as 3 are considered acceptable (Kline, 2005; Tabachnick & Fidell, 2007).

Table 2: CFAs goodness of fit indexes

	CFA Models	N	χ^2	df	χ^2/df	TLI	CFI	RMSEA	SRMR
1.	Basic Needs Satisfaction (3 correlated Factors, 9 items)	109	24.07	24	1.00	1.00	1.00	.005	.058
2.	Basic Needs Satisfaction, Beneficence, Cooperation Willingness	109	109.36	80	1.37	.937	.952	.058	.064

Table 3: Study 1 variables' Descriptives, Cronbach, CFA correlations

	Variables (N=109)	M	SD	alphas	1	2	3	4	5
1.	Autonomy Satisfaction	4.6	1.0	.80	1	.40*	.67***	.21 ^a	.36**
2.	Competence Satisfaction	5.1	.72	.67		1	.44**	.35*	.27*
3.	Relatedness Satisfaction	4.9	.90	.71			1	.50***	.49***
4.	Beneficence	4.6	1.2	.87				1	.21 ^b
5.	Cooperation Willingness	5.9	.85	.84					1

Note: ***p<.001, **p<.01, *p<.05, a=.066, b=.071

2.3 Brief Discussion of Study 1

It seems that pre-service teachers who present higher scores in needs satisfaction have higher levels of beneficence, higher sense of having a positive impact on their colleagues and they are more willing to cooperate with them. These patterns of relationships reveal the importance of creating environments that nurture teachers' basic need satisfaction, because in these contexts it is highly likely that they will cooperate more and that their actions will benefit each other (with more acts of benevolence).

3. Study 2: In-service PE Teachers

3.1 Material and Methods

The aim of this study was to reevaluate and confirm the dimensionality of the BNSST with a different population, to assess whether it exhibits the same factor structure with a sample of in-service PE teachers, and to provide evidence of criterion validity with autonomous motivation (i.e., intrinsic, identified), and other indicators of psychological wellbeing at work (i.e., satisfaction, engagement).

3.1.1 Participants and Procedure

The participant PE in-service teachers were recruited online, while they participated in a voluntary online professional training program. Prior to the study, an approval from authors' university ethics committee was obtained. PE teachers were informed about the purposes of the study, and confidentiality was emphasized. Participants responded voluntarily in anonymous electronic questionnaires via *Survey Monkey*. In order to collect data of high quality, due to online distribution of the questionnaires, two screening items for inattention check were included in the survey. Participants responded to the questions "I read the instructions carefully. To show that you are reading these instructions, please leave this question blank" (Maniaci & Rogge, 2014), and "It's important that you pay attention to the questions. Please click 'absolutely disagree'."

(Oppenheimer, Meyvis, & Davidenko, 2009) (From 1-absolutely Disagree to 7-absolutely Agree). In addition, very short survey completion times (i.e., less than five minutes) were considered insufficient. Of the initial sample of respondents (N=111), 20 cases failed to meet the abovementioned criteria. These cases were excluded from further analysis resulting in the final sample of 91 participants; 49.5% (45) male, and 50.5% (46) female. These participants, aged 35-61 years (49.1 ± 5.1), had a range of 1-31 years of teaching experience (17.7 ± 5.2). They all held a bachelor degree from departments of Physical Education and Sport Science of various Greek Universities, while about 62.6% (57) of them held a postgraduate degree. About 58% (53) had been working at the time of the study for Primary schools and 42% (38) for Secondary schools, which were distributed geographically throughout Greece.

3.1.2 Instruments

a. Basic Need Satisfaction Scale (Longo et al., 2016)

Following a similar procedure to the pilot study, the three factors, nine-item instrument underwent minor wording modifications in order to be adapted for the specific context of the online in-service training. Following the stem, "In this training..." participants provided their answers on a 7-point likert type scale (1/strongly disagree-7/strongly agree), in items such as "I feel completely free to make my own decisions" (autonomy satisfaction), "I feel highly effective at what I do" (competence satisfaction), "I feel very close and connected with other people" (relatedness satisfaction). Cronbach's alpha for each scale was above .71 (see Table 5); and for the aggregated scale was .68.

b. Teacher Autonomous Motivation to participate in training

PE teachers' autonomous motivation to participate in the online training was assessed using two subscales corresponding to intrinsic and identified regulations from the Greek version of the Work Task Motivation Scale for Teachers (WTMST; Gorozidis & Papaioannou, 2014, 2016; Fernet et al., 2008). Following the general stem "Why do you participate in this training?" teachers answered to items as, "Because I like doing it" (intrinsic), "Because I consider it important for the academic success of my students" (identified). Responses were given on a 7-point Likert type (from "1-does not correspond at all" to "7-corresponds completely). Cronbach's alphas for these scales were .82 and .85, respectively and for the aggregated scale was .74.

c. Work Satisfaction scale (Fernet, 2011; adapted from Diener et al., 1985; Bérubé, Donia, Gagné, Houltfort, & Lvin, 2016)

This scale consists of five items measuring individuals' satisfaction with their job. Answers were given on a 7-point Likert type scale ranging from 1 (strongly disagree) to 7 (strongly agree). e.g., items: "I am satisfied with my work", "In most ways, my work is close to my ideal". Cronbach's alpha of the scale was .85.

d. The Utrecht Work Engagement Scale (UWES-9; Schaufeli & Bakker, 2003)

The shortened version of the UWES was used, which consists of nine items, measuring the three underlying dimensions of work engagement: vigor, dedication, and absorption (3 items/scale) (Schaufeli, Bakker, & Salanova, 2006). Responses were given on a 7-point

frequency rating scale ranging from 0 (never) to 6 (always). Example items were: "At my work, I feel bursting with energy" (vigor), "My job inspires me" (dedication), "I feel happy when I am working intensely" (absorption). Cronbach's alphas for these sub-scales were .90, .85 and .80, respectively; and for the aggregated scale was .89.

3.1.3 Analytical approach - Statistics

Following a similar procedure to study 1, construct validity evaluated employing a within- (i.e., factors analysis & correlation patterns) & between-network (i.e., correlation patterns with external criteria) approach (Marsh, 1998). All analyses were conducted with the IBM SPSS & AMOS version 24 statistical package. Specifically, EFA-PCA and CFA were conducted using maximum likelihood estimation method. Internal consistency was evaluated through Cronbach's alpha index and latent variables' associations with external-criteria variables (CFA-SEM) were tested.

3.2 Findings of Study 2

3.2.1 Construct Validity - Internal consistency

Similarly, to study 1, EFA-PCA results supported the three-factor structure of the instrument. Principal component analysis with oblique rotation (oblimin) extracted three factors with eigenvalues >1, explaining the 68.7% of the total variance. Specifically, the first factor namely competence satisfaction explained 40.6% of the variance and all item loadings were >.76; the second factor namely relatedness satisfaction explained about 16.2% of the variance and all item loadings were >.53; and the third factor namely autonomy satisfaction explained 11.9% of the variance and all item loadings were >.68 (no items' cross-loadings were found). Cronbach's alpha of each scale was satisfactory >.71 (see Table 5).

To confirm the Construct Validity of the instrument we conducted a CFA. As in study 1 we emphasized a combination of goodness-of-fit indices, to assess model-fit. The results of the CFA showed that the model could further improve (Table 4. Model 1). Modification indices inspection revealed a significant correlation between two relatedness satisfaction items, which is theoretically justifiable and can be easily explained by the similar items wording. Thus, after correlating the two item residuals, CFA produced acceptable goodness of fit indices supporting the validity of the 9-item, 3-correlated factors model (see Table 4 model 2). In addition, as expected, correlation inspection in both CFAs supported our hypotheses showing that all three needs were significantly positively related with each other ($r > .49$, $p < .05$; Table 5).

Table 4. CFA goodness-of-fit indices Main study

	CFA Models	N	χ^2	df	χ^2/df	TLI	CFI	RMSEA	SRMR
1.	Needs Satisfaction (3 Correlated Factors-9 items)	91	48.87	24	2.04	.852	.901	.107	.073
2.	Needs Satisfaction (3 Correlated Factors-9 items, 2 correlated relatedness residuals)	91	37.66	23	1.64	.909	.942	.084	.058
3.	Needs Satisfaction & Intrinsic - Identified	91	110.74	80	1.38	.920	.939	.065	.068

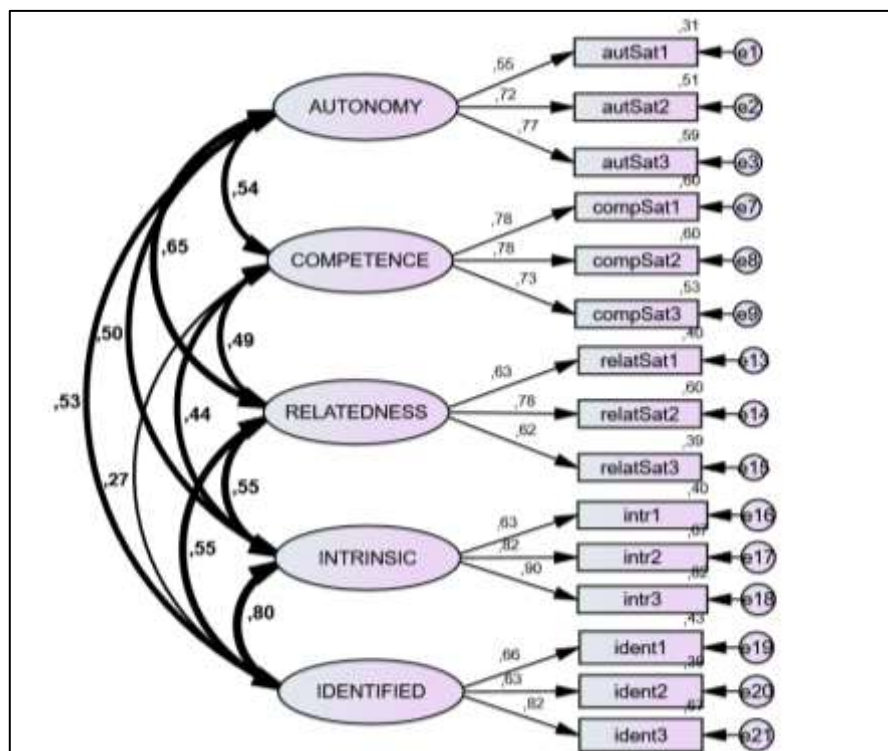


Figure 2: Full CFA, depicting relations between in-service teachers' basic needs satisfaction, intrinsic motivation and identified regulation

3.2.2 Convergent and Discriminant Validity

Furthermore, convergent and discriminant validity of the constructs was established via the examination of latent factors' associations in the full measurement model; in order to verify the distinctiveness between needs satisfaction (autonomy, competence, relatedness) and autonomous motivation (intrinsic, identified), all the SDT scales of the study were tested simultaneously in a single model. This analysis allows to confirm simultaneously both the between and the within-network independence of constructs. So, external-criterion construct validity was evaluated through the relationships of the Basic Needs Satisfaction with Intrinsic and Identified regulation variables. In line with SDT postulates, it emerged that teacher basic needs satisfaction in online training were positively related to their intrinsic motivation, and identified regulation to participate in training (Table 4 model 3, Table 5 & Figure 2).

Table 5: Study 2 variables' Descriptives, Cronbach, CFA correlations

	Variables (N=91)	M	SD	alpha	1	2	3	4	5
1.	Autonomy Satisfaction	5.3	.78	.71	1	.54**	.65**	.50**	.53**
2.	Competence Satisfaction	5.2	.87	.80		1	.49**	.44**	.27 ^a
3.	Relatedness Satisfaction	4.4	.79	.74			1	.55**	.55**
4.	Intrinsic motivation	5.9	1.0	.82				1	.80***
5.	Identified motivation	5.4	1.1	.75					1

Note: ***p<.001, **p<.01, *p<.05, ap=.061

3.2.3 Predictive Validity

To assess the predictive validity of the instrument we conducted three SEM analyses. Due to the small sample size of the study, in order to reduce parameters to be estimated in these analyses, we followed a commonly used procedure employed in SDT relevant research (e.g., Baard, Deci, & Ryan, 2004; Deci et al., 2001; Van den Broeck et al., 2008; Vansteenkiste et al., 2007). We used the three innate needs scale scores as indicators of the latent factor representing *general need satisfaction*, intrinsic-identified regulations combined to form *autonomous motivation* latent factor, and vigor-absorption-dedication variables aggregated to formulate *work engagement* factor (see Fig. 3, 4 & 5).

In order to examine the predictive ability of needs satisfaction to autonomous motivation, work engagement and work satisfaction, we constructed three SEMs. In these models, general need satisfaction was considered an exogenous variable and variables depicting work related well-being responses to situational/contextual conditions were considered endogenous. All the three models produced acceptable goodness-of-fit indices (Table 6), and suggested that the satisfaction of the three basic needs (i.e., general need satisfaction) can significantly positively predict work related well-being elements such as, teachers' autonomous motivation ($\beta=.78$, $p<.001$, SEM1; Fig.3), work engagement ($\beta=.40$, $p=.007$, SEM 2; Fig.4) and work satisfaction ($\beta=.48$, $p=.005$, SEM 3; Fig.5).

Table 6: SEM models Well-being prediction by General Need Satisfaction

	SEM Models	N	χ^2	df	χ^2/df	TLI	CFI	RMSEA	SRMR
1.	General need satisfaction to Autonomous motivation	91	6.30	4	1.57	.949	.979	.080	.036
2.	General need satisfaction to Work Engagement	91	7.06	8	.88	1.00	1.00	.000	.039
3.	General need satisfaction to Work Satisfaction	91	17.49	19	.92	1.00	1.00	.000	.051

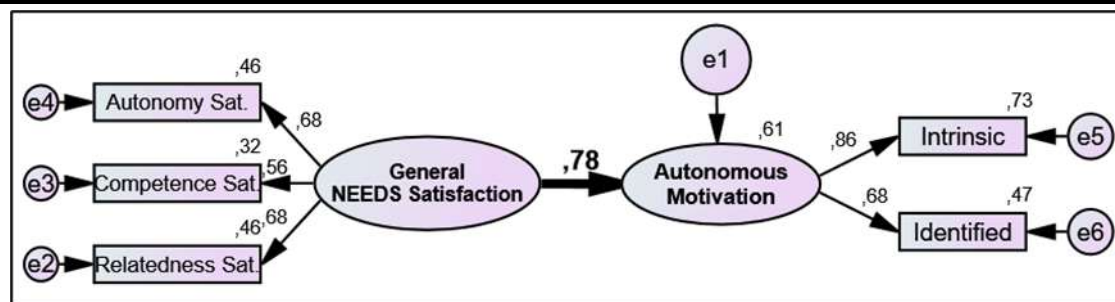


Figure 3: SEM 1: Structural model depicting relations between teachers' General needs satisfaction and Autonomous motivation to participate in training (Number in bold is significant ($p < .001$))

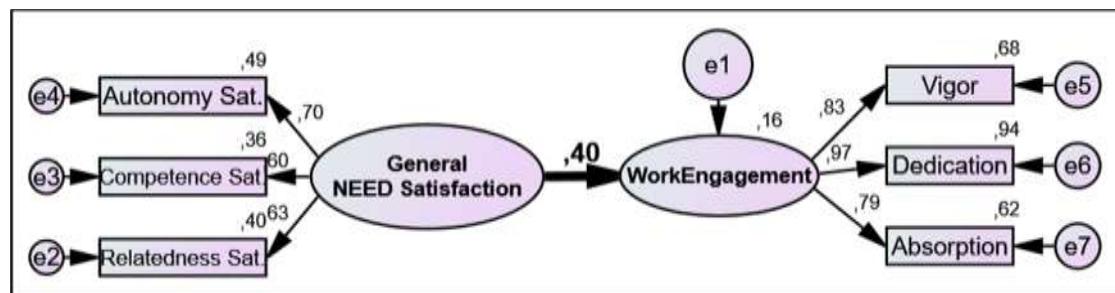


Figure 4: SEM 2: Structural model depicting relations between teachers' General needs satisfaction and Work engagement (Number in bold is significant ($p = .007$))

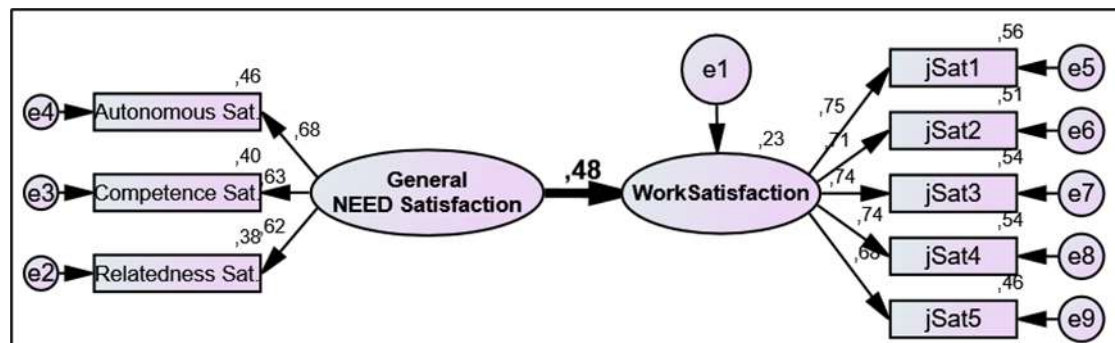


Figure 5. SEM 3: Structural model depicting relations between teachers' General needs satisfaction and Work satisfaction (Number in bold is significant ($p = .005$))

3.3 Brief Discussion of Study 2

It is evident that in-service PE teachers who present higher scores in needs satisfaction during their professional training have higher levels of autonomous motivation to participate in training, and higher levels of work engagement and satisfaction. The predictive ability of basic needs satisfaction on these work-related well-being elements suggest that it is very significant to structure environments that fuel teachers' basic need satisfaction, because these educational contexts it is very likely to support teachers optimal functioning and well-being.

4. General Discussion

In the present paper, drawing upon SDT, we followed a rigorous instrument validation procedure to evaluate a BNS measure in the Greek language for PE teacher population. We conducted two cross-sectional studies, one with pre-service and one with in-service PE teachers, and we found consistent evidence of construct validity, criterion validity, and predictive validity of the BNSS for teachers-GR version (Longo et al., 2016). Following a within- (i.e., factors analysis & correlation patterns) and between-network (i.e., correlation patterns with external criteria) approach (Marsh, 1998), we employed factor analytic techniques (EFA, CFA, SEM), with data obtained from two different samples. Analyses results exhibit that in both cases the psychometric properties and construct validity of the measurement were supported.

More precisely, it was found that all three PE teacher basic needs satisfaction related positively to their sense of beneficence, which is consistent with past research evidence (e.g., Martela & Ryan, 2016b).

In addition, it was found that teachers with basic needs fulfilled might be more willing to cooperate with their peers/colleagues which is consistent to SDT theorization that basic needs satisfaction is connected to positive motivational outcomes and behaviors (Deci & Ryan, 2000). Furthermore, in agreement with previous research (Lam, Cheng & Choy, 2010; Schellenbach-Zell & Gräsel, 2010) teacher autonomous motivation was predicted by their basic need satisfaction.

In this line, occupational research/literature suggests that well-being at work as it is represented by work engagement and job satisfaction, has been significantly positively connected with employees' basic needs satisfaction (e.g. Deci et al., 2001; Van den Broeck et al., 2010) which was also evident in our study 2. In sum, all the aforementioned findings support the validity of the instrument and suggest that it can be a useful tool in educational research examining PE teacher motivation and optimal functioning at their workplace, in the Greek context.

5. Conclusion

Instrument validation is an ongoing process, and this is preliminary evidence of this scale's psychometric properties. Such measurements can be used to further investigate innate psychological needs in Greek-speaking populations and may prove very useful in the examination of Greek PE teachers' needs satisfaction in diverse contexts and situations, such as school/work environment in general, in-service training context as well as in class/instruction environment. The multiple environments that may affect overall teacher job quality, behavior and well-being. All the above findings suggest that the Greek version of the BNSST is a valid and reliable instrument and provides initial support for its psychometric properties.

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Conflict of Interest

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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