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# Self-Regulations for Educators Questionnaire (SREQ) for implementation programming

Spyridoula Vazou,<sup>1</sup> Yang Bai,<sup>2</sup> Gabriella M. McLoughlin,<sup>1</sup> Gregory J. Welk<sup>1</sup>

<sup>1</sup>Department of Kinesiology, Iowa State University, Ames, IA 50011, USA

<sup>2</sup>Department of Health, Kinesiology, and Recreation, College of Health, University of Utah, Salt Lake City, UT 84112, USA

Correspondence to: S Vazou, svazou@iastate.edu

Cite this as: *TBM* 2020;XX:XX–XX doi: 10.1093/tbm/ibaa092

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## Abstract

The adoption and dissemination of evidence-based programs is predicated on multiple factors, including the degree to which key stakeholders are motivated to implement program best practices. The present study focuses on the development of indicators that capture motivations of teachers to adopt school wellness programming since personal motivations are central to achieving sustainable impacts in these settings. The study specifically describes the measurement development and validation of the Self-Regulations for Educators Questionnaire (SREQ), designed to measure educators' autonomous and controlled motivation for adopting evidence-based programming in their schools. A naturalistic design to study motivation to adopt aspects of NFL PLAY60 programming through the NFL PLAY60 FitnessGram Partnership Project was used. A total of 1,106 teachers completed the SREQ online. Internal validity was assessed through exploratory and confirmatory factor analysis, and predictive validity using structural equation modeling (SEM). The results supported the two-factor solution with separate items capturing aspects of autonomous and controlled motivation. Both factors had good internal reliability and the item-total correlation coefficients were above 0.40 for both factors. The results also supported the predictive validity as autonomous motivation positively predicted the level of overall engagement, teaching effectiveness, fitness testing reports sent home, and completion of fitness testing with students ( $p < .05$ ). Controlled motivation positively predicted whether the teachers conducted fitness testing and the engagement of Play 60 Challenge ( $p < .05$ ). Findings suggest that the SREQ displays a number of psychometric characteristics that make the instrument useful for examining motivation of providers to implement evidence-based best practices.

## Keywords

Motivation, Scale development, Self-determination theory, School, Wellness, Teachers

## INTRODUCTION

Promotion of physical activity in youth has been acknowledged as a public health priority by many prominent public health organizations [1, 2]; however, challenges arise in the adoption and utilization of evidence-based programming through schools [3]. Numerous studies have reported on school-based interventions to promote healthy lifestyles, but the impact of these studies has also been limited [4, 5]. One model that has been introduced

## Implications

**Practice:** School-based interventions and CSPAP initiatives can use the SREQ as a tool to measure educator's motivation for the implementation of evidence-based best practices.

**Policy:** Effective wellness programs must consider the motivation and readiness of providers in order to advance the dissemination of behavior change programming.

**Research:** Future research should be aimed at examining the utility of provider motivator with SREQ in other settings, such as within clinical and community dissemination efforts, for the implementation of evidence-based public health initiatives.

to the K-12 setting to increase student health is the comprehensive school physical activity program (CSPAP), developed by the CDC [6]. The fundamental purpose of a CSPAP is to facilitate school-based physical activity programming through a coordinated effort involving all school professionals, community, and family so that children have opportunities to be physically active throughout the school day.

Physical education teachers have been cited as key role players for the implementation of CSPAP and can facilitate the coordination of efforts from all school staff towards physical activity promotion [3, 5]. School staff engagement constitutes one of the components of CSPAP. School staff have been recommended to play an important role in physical activity promotion through the staffs' personal wellness experiences and beliefs as well as their level of involvement into programming [7]. Despite the increasing efforts on identifying contextual factors (e.g., time, support, and training) that affect physical activity programming within the CSPAP framework [8, 9] surprisingly, there is a paucity of research on motivational factors of school staff (e.g., motivation, attitudes, and beliefs) that are theorized to drive behavior [7, 10].

### Teacher motivation

A large body of literature has documented the utility of self-determination theory (SDT) for understanding human motivation [11–14], but less work has been done to study the motivation of teachers or public health leaders to implement programming. The essence of SDT is that an individual's motivation to carry out a certain behavior depends on environmental circumstances and their basic needs satisfaction [15]. In order for an individual to be intrinsically motivated to perform a behavior, their basic psychological needs of competence (high perceptions of their ability), autonomy (ability to self-regulate and control their actions), and relatedness (strong sense of connection to others) must be fulfilled [15]. However, extensions of the theory have posited that motivation is differentiated on a continuum based on the degree to which the person has internalized external motivators. The five categories on the continuum include external regulation, introjected regulation, identified regulation, integrated regulation and intrinsic motivation [16], factors that have also been examined using the more dichotomized groupings of controlled and autonomous motivation. In this classification, controlled motivation comprises external and introjected regulation, whereas autonomous motivation comprises identified, integrated, and intrinsic motivation [16]. These two forms are differentiated by the degree to which a person decides to act based on internal/external pressures (controlled), or of their own desires and intentions (autonomous). This advancement has integrated the influence of environmental factors on individuals' motivation to carry out certain behaviors and thus has expanded SDT to be more comprehensive in its application [11, 17].

Although applications to work-related motivation are limited, previous studies have examined individuals' motivation to help others and to exhibit prosocial behaviors [14, 18]. For instance, findings from work by Pavey et al. [18] demonstrated the positive mediating effect of autonomous motivation to help on prosocial behaviors, and the ways in which emotional empathy can enhance autonomous motivation. Applications to the field of teaching show similar relationships between autonomous motivation and altruistic behaviors [11, 19]. Negative associations between autonomous motivation and exhaustion have also been observed, implying that this construct may serve as a protective factor against work-related burnout [19, 20].

More recent studies have documented that the presence of autonomous motivation may predict teachers' willingness to infuse innovative practices and programs into their pedagogies [11, 21]. Specifically, Gorodizis and Papaioannou [11] analyzed teachers' motivation data and perceptions of innovative practices through a series of structural equation models (SEM) and qualitative

data collection procedures. They found that autonomously motivated teachers were more likely to pursue additional professional development opportunities and commit time to enhance their pedagogical knowledge and instruction [6]. Similarly, Vazou and Vlachopoulos [21] found that intrinsically motivated school staff were more willing to use activity breaks at school and participate in school wellness events to promote physical activity behavior in the future. Collectively, extant literature indicates that autonomous motivation is a driving factor of teachers' involvement in new initiatives and of promoting student learning through autonomy-supportive teaching.

Notwithstanding the literature to support the promotion of autonomy-supportive teaching, research pointing to teachers' motivations toward promoting physical activity in the school remains scarce. As research shows, lack of experience, training, and support for implementation hinders perceptions of competence [22–24]. The degree to which one or all of the psychological needs (competence, autonomy, relatedness) are satisfied or thwarted affects individual's motivation and in turn can predict future engagement and behavior [15]. Taking into account teachers' motivational dispositions toward physical activity integration is important in order to understand the interrelated intrapersonal and interpersonal factors in the school systems that can promote teacher engagement and, consequently, students' opportunities to be physically active throughout the school day. SDT provides a strong framework given the extant literature documenting relationships between autonomous motivation and other altruistic behaviors and was used in this study in order to develop a theoretically grounded measure of teachers' motivation for physical activity promotion.

### Implementation science

Despite the clear evidence, a gap in the literature is the lack of a theoretically grounded measure that captures motivational orientations of teachers to adopt and use evidence-based programs. Understanding the motivation and personal beliefs of the individuals implementing a program are critical constructs in order to advance the dissemination of behavior change programming. The field of dissemination and implementation science (D&I) boasts an array of research frameworks that help researchers and practitioners understand factors which influence successful adoption and implementation of evidence-based programming [25]. Motivation of individuals (i.e., teachers) tasked with implementing programs (i.e., CSPAPs) has been cited as an influential factor which could affect successful program execution [26, 27], in that individuals with more innovation-specific motivation to adopt a certain practice are likely to have greater capacity for implementation [28]. To advance work in this area, it is

important to have more robust measures to capture the motivations of program implementers.

The present study addresses this need by developing and evaluating an assessment (based on SDT constructs) that captures the motivation of educators to implement school wellness programming. The items were developed and evaluated iteratively through a large participatory research study on school physical education programming called the NFL Play 60 FitnessGram Partnership Project [29]. The project provided an ideal setting to develop and test motivational items since teachers had the autonomy to decide how involved they wanted to be with the recommended school programming. The specific purpose of this study was to develop a measure of teacher motivation for promoting physical activity and to test its predictive validity related to physical activity promotion through this ongoing participatory research project. Although the questions are specific to school physical activity programming, the intent of the scale development is that the approach would have broader utility for evaluating the motivation of community leaders, clinicians, and other public health practitioners to adopt evidence-based programming.

## METHODS

### Design and procedures

The study was conducted as part of a larger study on the evaluation of the NFL PLAY 60 FitnessGram partnership project conducted by the Cooper Institute in collaboration with the NFL PLAY60 Foundation [29]. The project, launched in 2010, was designed as a participatory research initiative to study methods to promote effective practices in school-based physical education. Consistent with national goals for the promotion of “Comprehensive School Physical Activity Programming” [6], schools

were encouraged to conduct annual fitness evaluations using the FitnessGram software and to use the NFL PLAY 60 programming in their school. The details of the design and structure of the study are available in the baseline paper [30], as well as in other related studies from this project [31, 32].

Teachers were provided with access to different NFL PLAY 60 programs (e.g., Play 60 Challenge and Fuel up to Play 60) and were encouraged to use them to promote physical activity and healthy eating in students. Teachers had the autonomy to select the programs that worked best for their individual school’s needs, resources, and infrastructure. An annual survey was distributed online through Qualtrics in April each year to capture data on the extent of programming implementation. One teacher from each participating site filled out the survey which provided the key information on their school engagement as well as the motivational items that are evaluated in this study. Samples in four distinct years from 2014 to 2017 were used for the purposes of this study. The sample size fluctuated from year to year with the largest sample of 535 teachers in 2014 and smallest sample of 205 teachers in 2016. However, except for minority rate in 2014 and 2016, no significant difference was found in student enrollment, percent of student qualified to free and reduced lunch, percent of minority students, geographic location, and grade levels from schools that teachers worked between different 4 years. The detailed sample characteristics from 2014 to 2017 are summarized in Table 1. The project was approved by the Cooper Institute Institutional Review Board.

### Measures

#### *Self-Regulations of Educators Questionnaire*

A list of 27 items was initially developed representing the autonomous and controlled motivation

**Table 1** | School demographic data from sample 1 (2014) to sample 4 (2017)

Year	2014	2015	2016	2017
<i>N</i> (Teachers)	535	340	206	281
Student enrollment	641 (417)	621 (413)	557 (398)	638 (464)
SES	49.6% (28.1%)	46.3% (28.8%)	45.7% (27.5%)	47.4% (26.7%)
Minority	44.6% (41.1%)*	42.5% (37.7%)	35.3% (42.4%)*	39.3% (38.7%)
Location				
City	198 (37.9%)	107 (32.2%)	46 (25.3%)	61 (28.8%)
Suburb	123 (23.6%)	87 (26.2%)	56 (30.8%)	59 (27.8%)
Town	74 (14.2%)	53 (16.0%)	27 (14.8%)	37 (17.5%)
Rural	127 (24.3%)	85 (25.6%)	53 (29.1%)	55 (25.9%)
School level				
Elementary	188 (41.3%)	134 (41.6%)	81 (44.5%)	96 (44.9%)
Middle	122 (26.8%)	90 (28.0%)	42 (23.1%)	52 (24.3%)
High	61 (13.4%)	41 (12.7%)	23 (12.6%)	32 (15.0%)
Mixed grade	84 (18.5%)	57 (17.7%)	36 (19.8%)	34 (15.9%)

\* $p < .05$ .

of educators, adapted from two motivational scales in the SDT literature; the adapted Situational Motivation Scale [21], as it was used to measure self-regulations of school personnel participating in a world wellness event, and the Motivation to Help Scale [14] that assesses autonomous or controlled motivation for helping others. Then, the items were reduced to ten based on the following two criteria: (a) the items with the stronger factor loading on both autonomous and controlled motivation, as identified in the Vazou and Vlachopoulos data set [21], and (b) unique items from the Motivation to Help Scale [14] that were perceived as relevant to the motivation of educators to promote students' health. To maintain congruence of the present scale with the theoretical construct it purports to measure, the selected items for autonomous and controlled motivation were similar to those utilized in the self-regulation scales, meaning autonomous = intrinsic motivation + identified regulation, and controlled = external + introjected regulations. The items follow the stem: "Why did you participate in the NFL PLAY 60 FitnessGram partnership project?" and each item was assigned a 5-point rating scale ranging from 1 = "strongly disagree" to 5 = "strongly agree." The initial ten items for the scale development are presented in Table 2.

#### Program compliance survey items

A list of questions from the annual survey were included in the study as outcome variables in the structural equation modeling to test the predictive validity of the motivation scales. The responses were reversely coded; thus, regardless of the levels of responses, the higher numbers in the outcome question indicate positive behaviors. Questions of compliance and perceptions of the FitnessGram testing included in this study are presented in Table 3.

#### Data analysis

##### Exploratory and confirmatory factor analyses

A series of steps with four independent samples were taken for the development of the Self-Regulations of Educators Questionnaire (SREQ). With sample 1, an Exploratory Factor Analysis (EFA; principal-axis factor analysis with oblimin rotation) was conducted in order to examine the factor structure of the ten items. The criterion for factor extraction was that factors should have eigenvalues greater than 1.0. Items with loadings of 0.32 or lower and with high-cross loadings (less than 0.10 difference) were identified as problematic. Next, a Confirmatory Factor Analysis (CFA) using Maximum Likelihood (ML) analysis was conducted with three independent samples (sample 2, 3, 4). The CFA was carried out using the EQS 6.2 software [33]. The criteria used to assess the model fit were the chi-square test ( $\chi^2$ ), the

**Table 2** | CFA factor loadings of Self-Regulation of Educators Questionnaire with sample 4

Factor/item Why did you participate in the NFL PLAY 60 FITNESSGRAMM partnership project?	1	2
<b>1. Autonomous</b>		
3. Because I believe it is important for my students	.863	
4. Because I enjoy trying new things	.667	
6. Because I really enjoy trying to improve as a teacher <sup>a</sup>	.897	
7. Because I care about students	.870	
9. Because I valued doing so	.861	
<b>1. Controlled</b>		
1. So that I would be liked		.477
2. Because I would feel bad about myself if I didn't		.687
5. Because it is something I was told to do <sup>a</sup>		.469
8. Because I felt I didn't have a choice <sup>a</sup>		.520
10. Because otherwise I would feel guilty		.954

<sup>a</sup>Items used at the initial scale development with samples 1 and 2: 5. "Because I want others to appreciate my work"; 6. "Because it gives me pleasure to try different things"; and 8. "Because I want others to appreciate my work." The numbers preceding the items indicate the order of each item in the survey.

non-normed fit index (NNFI), the comparative fit index (CFI), the Standardized Root Mean Square Residual (SRMR), and the Root Mean Square Error of Approximation (RMSEA). A good model fit is achieved if the NNFI and the CFI values are above 0.90 and close to 0.95, the SRMR is as high as 0.08, and the RMSEA is close to 0.06 [34]. Furthermore, a significant chi-square test ( $\chi^2$ ) indicates a poor model fit; however, this statistic becomes overly sensitive with large samples [35], and therefore, we relied more on the other fit indices provided by EQS 6.2 for the goodness of the models. The ratio of sample size to free parameters in all models exceeded the minimum ratio of 5:1 recommended by Bentler and Wu [33].

##### Item analysis

Item analysis was carried out using SPSS Version 26 to assess the homogeneity of the items comprising the autonomous and controlled motivation factors. Inter-item correlations, item-total correlations, and Cronbach's Alpha coefficient are indicative of the reliability and internal consistency of a scale [36]. The criteria used for the internal reliability were: (a) an inter-item correlation between  $r = 0.20$  and  $0.70$ , (b) a minimum corrected item-total correlation coefficient of  $r = 0.40$ , and (c) a coefficient alpha above  $0.70$ .

##### Predictive validity

Predictive validity was evaluated using structural equation modeling in two steps. The first step was to assess the fit of 10 motivation items in measurement

**Table 3** | Questions of compliance and perceptions of the NFL Play 60 FitnessGram Project

Question	Rating scale
1. Did you complete FITNESSGRAM testing in your school this past year?	No—Yes
2. Did students have the opportunity to practice the FITNESSGRAM tests prior to the collection of FITNESSGRAM scores for the project?	No—Yes, considerable opportunities (4-point)
3. How confident are you in the quality of FITNESSGRAM scores collected for the project?	Not confident—Very confident (3-point)
4. Does using the test results collected through FITNESSGRAM make your teaching more effective?	Definitely not—Definitely (4-point)
5. Did your school distribute reports to parents and/or students?	No—Plan to—Yes (3-point)
6. Rate your level of engagement in the NFL PLAY 60 FITNESSGRAM project?	Not engaged—Very engaged (4-point)
7. Did you participate in the NFL PLAY 60 Challenge program this past school year?	No—Yes
8. Did you participate in the Fuel Up to Play 60 program this past school year (a grant is not required to participate)?	No—Yes
9. Did you administer the Youth Activity Profile to students this past year?	No—Yes

model and two latent variables (autonomous and controlled motivation factors) were created based on the factor and item analysis. The second step was to assess the fit of the two motivation latent variables predicting fitness testing or programming implementation compliance in the structural model. Nine models were run separately for each outcome variable. The structural equation model diagram is depicted in Fig. 1. Data were analyzed separately for the 2016 and 2017 school years. Similar to CFA, model fit was assessed using RMSEA < 0.08, CFI > 0.90, SRMR < 0.06, and Tucker–Lewis index TLI > 0.90. Structural equation model analyses were conducted using Mplus Version 8.2.

## RESULTS

### Structural validity and internal consistency

The steps of the analysis for the SREQ development, the model fit, the correlation of the factors from the factor analysis, and the results from the item analysis are presented in Fig. 2. The first step in the analysis for the factor structure of the SREQ was through Exploratory Factor Analysis (EFA). As the results showed, EFA with sample 1 produced two factors with ten items that accounted for 48% of the variance. All items met the aforementioned criteria except for two items that were marginal. Item 8 had low loading that was slightly above the threshold (0.34) and item 5 cross-loaded on both factors with 0.08 difference (0.33 and 0.41) that was marginally higher than the criterion. The second step was to examine the latent structure of the SREQ with CFA with an independent sample. All ten items were retained and tested with CFA as the two items that appeared to be problematic were marginal and we did not want to exclude items before being further evaluated. The results from CFA with sample 2 showed an inadequate fit of the model

to the data. Inspection of the modification indices and the standardized residual matrix revealed that three items (items 5, 6, and 8) were problematic. These items were excluded and another CFA was conducted with a marked improvement in the fit indices (CFA2—7 items; Fig. 2). The next step in the measurement development was to replace the three problematic items with three new ones in order to examine whether a 10-item 2-factor model would be valid. Two CFAs with independent samples (samples 3 and 4) were conducted with the modified scale showing similar adequate fit indices in both models (CFA3, CFA4; Fig. 2). The final items and the factor loading of the SREQ are presented in Table 2. The correlation among the two factors were negative and significant (−0.262 and −0.255, respectively;  $p < .05$ ) showing low levels of multicollinearity.

The results from the item analysis for the final items (from samples 3 and 4) of autonomous and controlled motivation were satisfactory with a minimum corrected item-total correlation coefficient being  $r = 0.509$  for controlled motivation and  $r = 0.533$  for autonomous motivation. Furthermore, inter-item correlations met the minimum criteria of being higher than 0.20 but were slightly above the recommended upper limit of 0.70 (ranging between 0.235 and 0.755 for controlled and between 0.433 and 0.773 for autonomous motivation). Cronbach coefficient alphas were above 0.70 for both the autonomy and controlled motivation factors (see Fig. 2).

### Predictive validity

Table 4 displays the coefficient estimates, standard errors, and model fit index from the controlled and autonomous motivation latent variables in predicting nine different outcome variables. The structural models fit well in all nine different models because all the RMSEAs were less than 0.08, except for the

### Steps of analysis for SREQ development

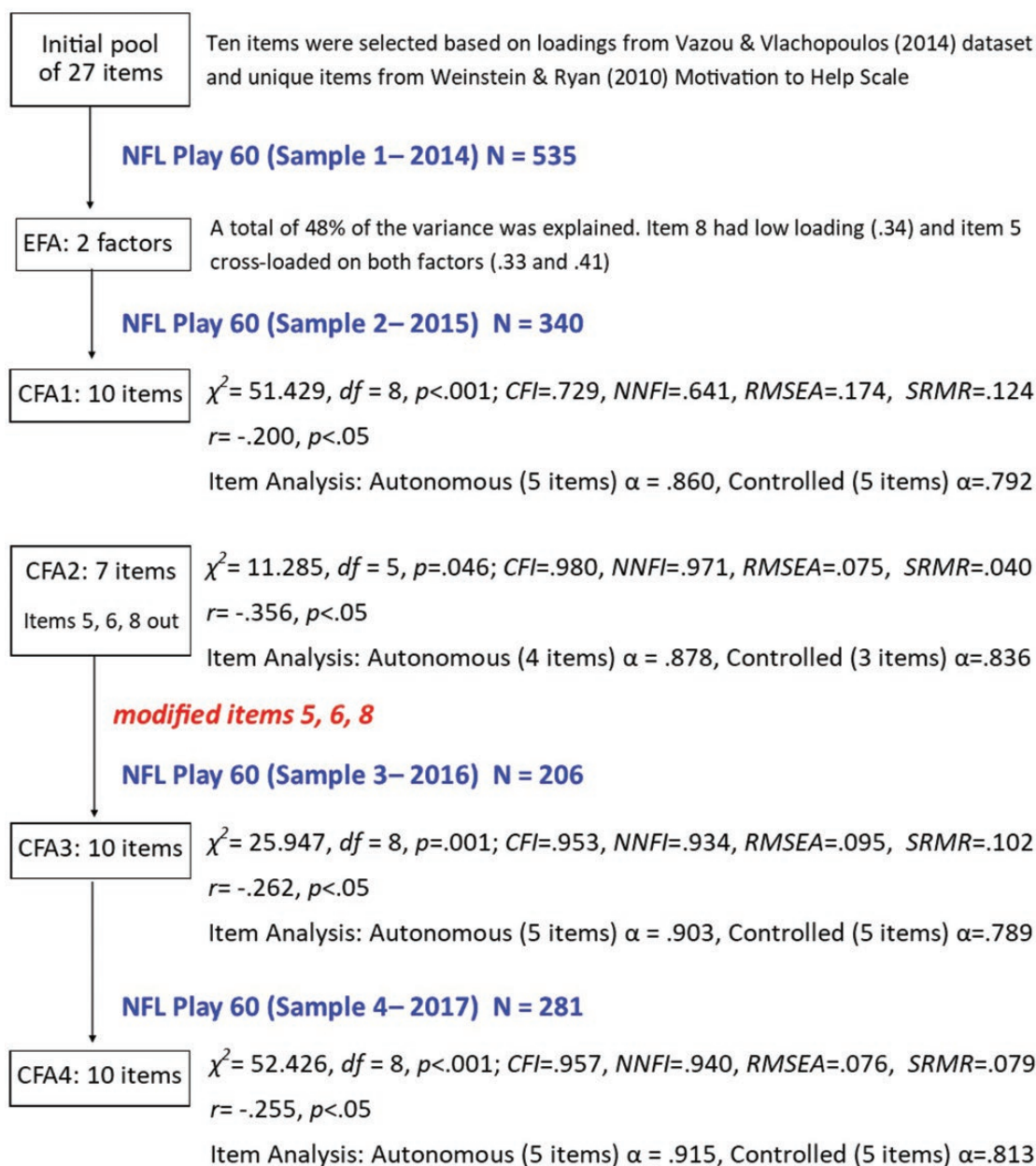


Fig. 1 | The diagram of structural equation modeling to test the predictive validity of motivational items.

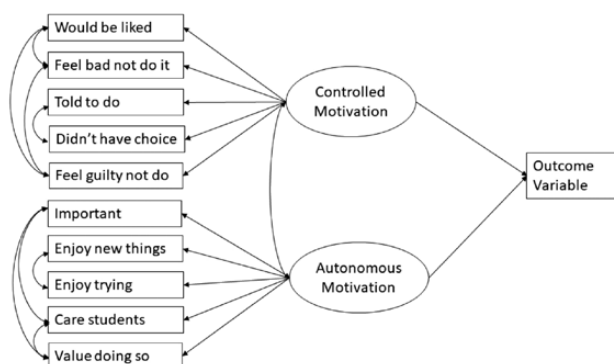


Fig. 2 | Flow chart of sample and results for the SREQ measurement development.

Table 4 | Predictive validity results linking motivational orientations of SREQ with indicators of programming engagement

	Report home	Confidence in FG Score	Practice	Fitness testing	Engagement FG project	Teaching effectiveness	Administer YAP	Partcpt FUTP	Partcpt Challenge
2016									
Controlled	-0.220 (0.178)	0.022 (0.185)	-0.079 (0.103)	0.013 (0.068)	0.271 (0.258)	0.024 (0.105)	-0.223 (0.147)	0.169 (0.162)	0.509 (0.199)*
Autonomous	0.094 (0.062)	-0.025 (0.066)	0.028 (0.035)	-0.010 (0.025)	0.262 (0.094)**	0.075 (0.037)*	0.016 (0.051)	0.059 (0.058)	0.052 (0.065)
Model fit									
SRMR	0.049	0.051	0.054	0.048	0.052	0.054	0.045	0.055	0.028
RMSEA	0.027	0.029	0.033	0.028	0.028	0.037	0.028	0.03	0.055
CFI	0.987	0.986	0.984	0.987	0.985	0.984	0.989	0.984	0.983
TLI	0.979	0.977	0.974	0.979	0.976	0.973	0.981	0.973	0.973
2017									
Controlled	-0.063 (0.184)	-0.020 (0.111)	0.163 (0.154)	0.113 (0.049)*	-0.191 (0.171)	-0.170 (0.198)	0.038 (0.088)	0.028 (0.113)	0.022 (0.904)
Autonomous	0.127 (0.056)*	0.032 (0.041)	0.097 (0.058)***	0.030 (0.017)***	0.212 (0.063)**	0.231 (0.061)**	0.041 (0.031)	0.033 (0.041)	-0.025 (0.699)
Model fit									
SRMR	0.041	0.036	0.04	0.032	0.038	0.052	0.035	0.037	0.034
RMSEA	0.069	0.061	0.07	0.058	0.065	0.083	0.062	0.064	0.067
CFI	0.975	0.98	0.974	0.982	0.978	0.964	0.98	0.978	0.976
TLI	0.96	0.968	0.958	0.971	0.964	0.942	0.967	0.965	0.962

Values for autonomous and controlled motivation reflect coefficients and standard errors from structural equation models in sample 3 (2016) and sample 4 (2017) and associated *p* values (\**p* < .05; \*\**p* < .01; \*\*\**p* < .1). FG = FitnessGram; YAP = Youth Activity Profile; Partcpt = participate; FUTP = Fuel Up to Play 60; Challenge = Play 60 Challenge.



teaching effectiveness as an outcome variable model in sample 4, which was marginal (RMSEA = 0.083). The CFI and TLI from all models were greater than 0.90, and SRMRs were less than 0.06 in all models. With some exceptions, coefficients with autonomous motivation tended to be positively linked with programming variables while coefficients with controlled motivation tended to be lower or negative. The clearest difference in patterns were evident for predicting the level of overall engagement in the project and the impact on teaching effectiveness. Although still relatively small, coefficients with autonomous motivation in both samples 3 and 4 were larger and more positive than with controlled motivation. This means that higher autonomous motivation the teachers had, the more likely that they were to engage in the overall project and to use the fitness testing to improve their teaching. In the 2017 dataset (sample 4), autonomous motivation also positively predicted whether teachers would send fitness testing reports home and whether they conducted fitness testing with their students ( $p < .05$ ). Interestingly, controlled motivation was more positively associated with the engagement of Play 60 Challenge in sample 3. Controlled motivation also positively predicted whether the teachers conducted fitness testing ( $p < .05$ ).

## DISCUSSION

Health and wellness programming in schools is widely encouraged to promote healthy lifestyles and to support broader academic achievement outcomes in youth [1, 37] but it is not widely adopted. The purpose of this study was to develop and test the internal and predictive validity of a new measure, named SREQ, designed to capture teachers' motivation for adopting school wellness programming. For that purpose, a series of procedures were followed, involving item adaptation from valid motivational measures, pilot testing, EFA, item analysis, and a series of CFA with four independent samples. The results of the final CFA with two independent samples (samples 3 and 4) supported the two-factor solution of the SREQ, in which five items tapped autonomous motivation and five items tapped controlled motivation. Autonomous and controlled motivation in SREQ were distinct factors that were also significantly correlated, providing a structure that is consistent with the constructs of SDT and existing questionnaires [11, 12, 14, 16].

The present study provides direct evidence to support the utility of motivation as an important predictor of NFL PLAY 60 implementation; however, it also complements a growing body of research on classroom and physical education teachers' perspectives toward comprehensive physical activity promotion through CSPAP frameworks [8, 22, 38, 39]. Previous studies have documented that, in general, teachers have positive attitudes towards CSPAP integration and physical activity promotion [7, 10].

Recently, Webster and colleagues [40], drawing from the diffusion of innovations theory, developed a scale that includes perceived attributes of physical education teachers that could help them better adopt CSPAP, including attitudes and personal beliefs. However, as with any new scale, the effectiveness of those attributes need to be further examined. The present study documents that motivation may also explain variability in program implementation but it is important to put the results back into the context of SDT to interpret the implications.

In the present study, it was found that autonomous motivation was more positively associated with teachers' adherence to programming recommendations, a finding that offers new insights for studies examining program adoption and implementation. Prior research has shown the positive associations between autonomous motivation and other positive implementation characteristics [17, 41, 42]; thus, our findings align with existing literature. However, a novel finding was that controlled motivation was also positively associated with several programming indicators. Controlled motivation was associated with engagement of PLAY 60 programming in the 2016 data set and with conducting fitness testing in the 2017 data set. This conflicts with some prior research showing that controlled motivation was either negatively or/not associated with altruistic and/or proactive implementation behaviors [11, 14, 17, 18]. A potential explanation for this may be derived from how teachers become involved in NFL Play 60 programming and to what degree they consider their involvement as something they *should* do versus what they *want* to do. For instance, in regard to fitness testing, prior research has found that teachers do not view this as a high pedagogical priority but feel somewhat obligated to conduct these assessments due to organizational pressure [43, 44]. Accordingly, teachers may also feel a sense of obligation to complete the fitness assessments since their school was chosen to participate in the NFL PLAY 60 project. Teachers could also feel an obligation to appease or impress the respective franchise liaison of champion in their region. Further investigation is warranted to understand situational motivation and the ways in which teachers and other chosen "implementers" perceive certain aspects of programming in order to enhance program adoption and utilization.

Teachers' autonomous motivation was found to be predictive of implementing best practices of the NFL Play 60 initiative. Therefore, this e-study provides further findings related to this large participatory research initiative [29]. The NFL PLAY 60 FitnessGram project is unique in both scope and concept since it captures the nature and impact of programming in hundreds of schools under naturalistic conditions. A previous study with this sample documented large differences in fitness trajectories between schools that implemented programming

and those that did not [32]. These results supported the benefits of coordinated school-based programming, but the more fundamental question has been why some schools successfully adopt and implement programming while others do not. The challenges of disseminating evidence-based programs have been well characterized in the public health literature [45, 46] and considerable efforts have been made in implementation science research to identify factors influencing implementation [47, 48]. Reviews of school-based CSPAP applications have noted similar challenges with implementation [5, 49], but, as with the broader literature on the subject, it has proven difficult to identify the more proximal causes [50].

Overall, the present study provides evidence to support the utility of the SREQ items for capturing motivation of teachers for adopting the NFL Play 60 initiative, the selection of items was made with the goal the scale to be usable in a wide range of evidence-based programming. However, as validation is an ongoing process, the extent to which SREQ can capture motivation of educators in different program implementation settings needs to be tested in future studies. A key strength of the study was the sequential and iterative testing of the items since it allowed for modification and refinement of wording, resulting in a valid measure of educators' motivation for use in program implementation. Another major advantage was the naturalistic design and the ability to test the predictive validity in two sequential years of data collection. These features provided rich datasets to evaluate both the reliability and predictive validity of the SREQ items.

However, despite the strengths of this study, there are some important limitations that also should be noted. One limitation was the cross-sectional nature in which this study was conducted. Teachers completed this survey at the end of 2016 and 2017 but this was at the end of an academic year; thus, the timing of the survey completion may have affected teachers' perceptions of the program and their own motivation. Administering the survey at different times throughout the school year or across multiple years may be a more beneficial strategy to enhance the validity of data. Furthermore, in an attempt to provide a concise survey to teachers, the measure unfortunately does not capture forces that influence motivation or the impact of motivation on specific aspects of programming. It is difficult to confirm which components are viewed more positively than others but these factors will be examined in subsequent research with this sample.

In summary, the findings of this study show good psychometric properties of the new questionnaire and document the value of the SREQ items for capturing motivation of teachers for implementing evidence-based programming in schools. The importance of provider motivation was referenced as a likely predictor of implementation in an

expert-panel review of implementation research in schools [50]. Thus, the present tool provides a way to capture this construct in future school-based interventions and CSPAP initiatives. However, it is noteworthy that motivation and readiness are also emphasized within several established public health implementation science frameworks [26, 51, 52]. While the current version of SREQ tested here was specific for school-based research, it is customizable to suit other programs by changing the stem of the questions asked (i.e., "I chose to participate in [insert program]"). Thus, it provides a useful tool that can be adapted to study provider motivation in a variety of different lines of implementation research. Further research should be conducted to examine its utility in other settings, such as within clinical and community dissemination efforts, to examine predictive validity to implement evidence-based public health initiatives.

**Funding:** No funding was provided for this study.

#### Compliance with Ethical Standards

**Conflicts of Interest:** All authors declare that they have no conflict of interest for this research.

**Author Contributions:** Conceptualization of research design S.V., G.J.W., Y.B.; Data collection and processing Y.B.; Data analysis S.V.; All authors contributed to the writing and the interpretation of the results. All authors have read and agreed to the final version of the manuscript.

**Ethical Approval:** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. The study was approved by the Cooper Institute Institutional Review Board.

**Informed Consent:** Informed consent was obtained from all individual participants included in the study.

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