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ARTICLE

Measuring and Comparing Physical Education Teachers' Perceived Attributes of CSPAPs: An Innovation Adoption Perspective

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Purpose: Drawing from the diffusion of innovations theory, this study aimed to develop a survey to measure physical education teachers' perceived attributes of comprehensive school physical activity programs (CSPAPs) and examine the differences between adopters' and potential adopters' perceived attributes. **Method**: The authors created an electronic survey and e-mailed it to 2,955 physical education teachers identified from a random sample of all public schools in the United States. The participants' ($N = 407$) responses were analyzed using the exploratory structural equation modeling framework. **Results**: The exploratory structural equation modeling yielded five factors: (a) compatibility, (b) relative advantage, (c) observability, (d) simplicity, and (e) trialability ($\chi^2/df = 3.2$; root mean square error of approximation = .074; comparative-fit index = .983; Tucker–Lewis index = .971; weighted root mean residual = .668). Compared with potential adopters, teachers who had already adopted a CSPAP perceived CSPAPs as simpler to implement but less trialable. **Discussion/Conclusion**: This study advances the measurement for CSPAP implementation and offers insight into program attributes that merit a targeted focus in efforts to increase CSPAP adoption.

Keywords: comprehensive school physical activity program, diffusion of innovations theory, program adoption, survey, whole-of-school approach

In the last decade, the comprehensive school physical activity program (CSPAP) model emerged as a paradigm for school-based physical activity (PA) promotion (Centers for Disease Control and Prevention, 2013; National Association for Sport and Physical Education, 2008; Society of Health and Physical Educators [SHAPE]America, 2015). A CSPAP is a multicomponent approach to increasing the PA and physical literacy of all school-aged children and youth. The components of a CSPAP can include (a) physical education, (b) PA during school, (c) PA before and after school, (d) staff involvement, and (e) family and community engagement. Coordination and collaboration of school professionals, parents, and community organizations via a CSPAP are intended to ensure that all children and adolescents accrue the nationally recommended 60 min of mostly moderate-to-vigorous PA each day, as well as achieve the educational outcomes deemed necessary to pursue a lifetime of PA. Mounting research supports the efficacy of CSPAPs in increasing PA outcomes for children and adolescents (Chen & Gu, 2017; Erwin, Beighle, Carson, & Castelli, 2013; Russ, Webster, Beets, & Phillips, 2015).

Physical activity promotion in the school environment is not new, and multicomponent approaches existed long before the introduction of the CSPAP model (Kelder, Goc Karp, Scruggs, & Brown, 2014). Nevertheless, the conceptualization of a CSPAP reified the various notions and iterations of school-based PA and provided potential adopters of multicomponent approaches with a clearer framework for program development and implementation. Since its inception, the CSPAP model has become the sine qua non of whole-of-school approaches to PA promotion. CSPAPs offer new direction and guidance for potential adopters and can therefore be viewed as an innovation in the field.

Many of the recommendations for implementing CSPAPs call upon physical education teachers to play an integral role in program adoption (Webster, Beets, Weaver, Vazou, & Russ, 2015). Physical education is identified as the cornerstone component of a CSPAP, and physical education teachers are commonly understood to be the resident experts in schools when it comes to promoting PA (SHAPE America, 2015). Yet, little research has investigated CSPAP adoption from the perspective of physical education teachers. Our focus in the present study was the assessment of physical education teachers' perceptions related to the adoption of

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CSPAPs. Using the diffusion of innovations theory (DOIT) as a theoretical framework, we focused on measuring physical education teachers' perceived attributes of CSPAPs.

Diffusion of Innovations Theory

Based on extensive research from multiple fields, DOIT (Rogers, 1995, 2002) explicates the processes that lead to the adoption and diffusion of an innovation. The stages of adoption include knowledge, persuasion, decision, implementation, and confirmation. In the knowledge stage, potential adopters become aware of the innovation through various communication channels and learn about how to use the innovation, as well as how the innovation works. The persuasion stage involves potential adopters' evaluating the innovation by considering its attributes, including its (a) relative advantage (RAD), or the degree to which potential adopters rate the innovation as having more advantages than the program, tools, or products they currently use, (b) compatibility (COM), or the degree to which potential adopters rate the innovation as a good fit for their experiences, values, competencies, and needs, (c) complexity, or the degree to which potential adopters rate the innovation as difficult or simple to implement, (d) trialability (TRI; i.e., testability), or the degree to which potential adopters rate the innovation as something they can try on a limited basis or in parts before fully implementing it, and (e) observability (OBS), or the degree to which potential adopters rate the innovation's benefits as visible to others. Potential adopters then move to the decision stage, during which they decide whether to adopt or reject the innovation. Next, in the implementation stage, new adopters adopt the innovation or reinvent it to fit their specific purposes and needs. Finally, the confirmation stage is where adopters reevaluate their decision to adopt the innovation and decide to continue or discontinue their use of the innovation.

Like the present study, previous DOIT research often has focused on the persuasion stage of the adoption process, specifically the five perceived attributes of the innovation. DOIT identifies perceived attributes as a key predictor of the rate of adoption; the more favorable the innovation's attributes are perceived, the more quickly it is adopted. Across multiple studies, perceived attributes explained 49%–87% of the variance in rate of adoption (Rogers, 1995). DOIT research with elementary classroom teachers, who can play a major role in CSPAP implementation (Webster et al., 2015), found that perceived COM, perceived simplicity (SIM), and perceived OBS were significant direct predictors of teachers' self-reported use of classroom-based PA promotion (Webster et al., 2013). Thus, to maximize the rate of CSPAP adoption, it is essential to understand how potential adopters perceive the attributes of a CSPAP. Moreover, as those who adopt an innovation reevaluate their decision to do so in the confirmation stage of the adoption process, and this leads either to their continuing or discontinuing to use the innovation, it is just as important to understand how physical education teachers perceive CSPAPs following their decision to adopt one.

Given that physical education teachers often are considered central to the CSPAP adoption process, it is essential for researchers to identify the attributes of a CSPAP that physical education teachers, including adopters and potential adopters, perceive more and less favorably. This information can be used to inform the design of in-service professional development initiatives for physical education teachers and preservice teacher education programming for teacher candidates. Specifically, for innovation attributes that teachers rate lower than others, certain advantages, benefits, and other positive aspects of CSPAPs can be emphasized in these professional and preprofessional learning contexts to increase the rate of adoption among potential adopters and help to ensure continued program implementation among adopters. Currently, however, we are unaware of any measures that exist to assess physical education teachers' perceived attributes of a CSPAP. Therefore, the purpose of this study was twofold (a) to develop a DOIT-based measure of physical education teachers' perceived attributes of a CSPAP and (b) to compare adopters' and potential adopters' perceived attributes of a CSPAP.

Methods

Participants

The participants in this study included a total of 515 individuals who participated in different parts of the study, described in the following sections (see "Procedures" section).

Instrumentation

We developed an online survey as part of a larger investigation of physical education teachers' perceptions of CSPAPs. The final version of the survey—specifically, the parts of the survey used in the present study—is described in this section, whereas the development of the survey, including its formative iterations, is described in the "Procedures" section that follows.

The first page of the survey presented an informed consent form. An introduction page with information describing a CSPAP, the unique position of physical education teachers in championing CSPAPs, and the purpose of the survey followed the informed consent. On the third page, we asked the respondents to select *yes* or *no* to whether their school currently has a CSPAP. The participants were instructed to only respond *yes* if

> [their] school provides *OPPORTUNITIES*, through any variety or combination of program components (physical education, PA during school, PA before and after school, staff involvement, family and community engagement) for *all students at their school* to (a) receive quality educational experiences designed to prepare individuals for a lifetime of participation in PA *and* (b) meet the national guideline for school-aged youth to accumulate at least 60 minutes of mostly moderate-to-vigorous PA each day (including time in and out of school).

The next section of the survey measured the perceived attributes of a CSPAP. Two identical sets of 42 items were used for this purpose, with the first set designed for participants who responded *no* about their school having a CSPAP (i.e., potential adopters) and the second set designed for participants who responded *yes* about their school having a CSPAP (i.e., adopters). The items for the potential adopters were written using hypothetical language (e.g., *I would be able to implement a CSPAP on a trial basis*), whereas the items for the adopters were written using the present or past tense (e.g., *I was able to implement a CSPAP on a trial basis*). Following the perceived attributes items, an additional eight items were included to assess all participants' school context (two items), teacher background (three items), and demographic information (three items).

A 6-point Likert-type response scale was used for items measuring perceived attributes. The response options included *strongly agree*, *agree*, *somewhat agree*, *somewhat disagree*,

disagree, and *strongly disagree*. The participants also could select a *don't know* option. Based on the pilot test (see "Procedures" section), a 6-point Likert-type scale was used because it allowed for a broad range of response variability, while also identifying distinct response options that could be assigned meaningful labels to increase option clarity and reduce scale interpretability (Johnson & Morgan, 2016). For attitude scales, several researchers have recommended the use of five to seven scale points (Fink, 2003; Krosnick & Fabrigar, 1997). Furthermore, ordered categorical variables with five categories or more are associated with less estimation bias in latent variable modeling and give researchers the option to treat the data as either continuous or ordered categorical (Finney & DiStefano, 2006).

Procedures

The procedures for this study consisted of three phases: (a) item construction, (b) pilot testing, and (c) administration of the survey to the main study sample. SurveyMonkey (San Mateo, CA) was used to build, pilot test, and administer the survey.

Item construction. Item construction was led by the first author, who is a nationally and internationally known CSPAP researcher with experience publishing survey research focusing on CSPAP and DOIT. We conducted an extensive literature search to identify published studies, doctoral dissertations, and master's theses in the areas of CSPAP and DOIT with instrumentation that could be drawn upon to develop the survey for this study. While considering the content (e.g., survey items, interview questions) from this previous research (Al-Jabri & Sohail, 2012; Argawal & Prasad, 1997; Atkinson, 2007; Helitzer, Heath, Maltrud, Sullivan, & Alverson, 2003; Hunt, 2017; Lounsbery, McKenzie, Morrow, & Holt, 2011; Makse & Volden, 2011; Moore & Benbasat, 1991; Pankratz, Hallfors, & Cho, 2002; Webster et al., 2013), we also consulted Rogers' (1995, 2002) seminal texts on DOIT to ensure that the item construction reflected the full depth and breadth of each theoretical construct (i.e., the five perceived attributes) pertinent to the study. A total of 236 items were written, encompassing CSPAP adoption (one item), perceived attributes (116 items—58 items for the respondents indicating that their school does not have a CSPAP and 58 items for the respondents indicating that their school does have a CSPAP), school context (two items), teacher background (three items), demographic information (three items), and additional variables not included in the present study (111 items). A response scale, which included the six aforementioned Likert-type options ranging from *strongly agree* to *strongly disagree*, as well as directions for the participants and an introduction to the survey, were also developed during this phase of the study.

Pilot testing. Prior to collecting the data, we obtained approval from University of South Carolina Institutional Review Board to conduct the study. The survey was subjected to two rounds of pilot testing. In the first pilot, we sent the survey to 77 researchers in the areas of CSPAP ($n = 40$) and DOIT ($n = 37$) to assess content validity and obtain general feedback about the survey (e.g., formatting, clarity). We first sent the survey to the CSPAP researchers. The researchers were identified from a list of authors contributing to a book about CSPAP research and practice (Carson & Webster, in press). All of the identified researchers, who were university faculty, including seven assistant professors, 13 associate professors, and 20 full professors, have multiple research publications ($M = 88$) on a broad range of topics related to, or focused directly on, CSPAP. For each section of the survey, we instructed the researchers to rate the appropriateness of the items (*completely appropriate*, *mostly appropriate*, *somewhat inappropriate*, and *mostly inappropriate*) and provide comments. The survey remained open for 3 weeks, and we sent three follow-up e-mails to encourage participation. A total of 23 CSPAP researchers (58% response rate) provided responses. We combined the ratings of completely appropriate and mostly appropriate and averaged the item scores, resulting in a mean score of 0.78, indicating a majority agreement that the survey items were appropriate, given the focus of the study. Then, based on the participants' comments, we made revisions to the survey. For example, although the participants' felt that the 6-point Likert-type scale was appropriate for the survey, they also felt that some physical education teachers would not have sufficient awareness, understanding, or experience to rate certain CSPAP attributes. We therefore added a *don't know* option to the response scale for the items measuring perceived attributes. Furthermore, we rewrote the negatively worded items to be positively stated or removed these items and replaced vague words with more specific ones where appropriate.

We sent the revised survey to the DOIT researchers and asked them to match items to their intended constructs and to provide general comments about the survey. The DOIT researchers were identified from an online search of academic databases. A list of all authors on published research articles focusing on the perceived attributes of innovations and using a DOIT framework was created. The authors had extensive publication records ($M = 103$) and were university faculty, including one instructor, five assistant professors, nine associate professors, and 20 full professors, as well as professionals in other research/academic positions, including one senior data analyst, one physician, and one associate director. Again, the survey remained open for 3 weeks, and we sent three follow-up e-mails to encourage participation. There were 10 respondents (27% response rate). We used an interrater agreement criterion of .70 to retain items and subsequently removed 43 items for perceived attributes and other DOIT variables not included in the present study. The items were removed either because they did not meet the agreement criterion or because the participants agreed that the item measured a particular construct, but the item had not been intended to measure that construct. This resulted in 100 items remaining to measure perceived attributes.

For the second round of pilot testing, we sent the survey to a convenience sample of 45 physical education teachers to obtain data for an initial statistical analysis of the items. A total of 31 teachers (17 CSPAP adopters and 14 potential CSPAP adopters) responded (69% response rate). The participants' demographic, teacher background, and school context information are reported in Table 1. We used preliminary exploratory factor analysis with Bayesian estimation to individually examine each construct by group. Although exploratory factor analysis is generally regarded as a procedure for large sample sizes, with $N = 50$ as a recommended minimum sample size, more recent research showed that when data are well conditioned (i.e., high α, low f, high p), exploratory factor analysis can provide accurate results with samples well below 50 and as small as 20 or 10 individuals (de Winter, Dodou, & Wieringa, 2009; Preacher & MacCallum, 2002). Furthermore, the Bayesian estimation method does not rely on a large-sample theory and, therefore, can provide accurate results with very small sample sizes (Heerwegh, 2014; Muthén & Asparouhov, 2012). The survey items had statistically significant loadings, above the cutoff of .320 (Costello & Osborne, 2005) under the corresponding factor. For CSPAP adopters, the α_τ nonparametric coefficients of internal consistency (Trippi & Settle, 1976) for the

Table 1 Participant Demographics, Teacher Background, and School Context Information for Pilot 2 Sample and Main Study Sample

Age	Gender	Race/ethnicity	Years of experience teaching physical education	State where employed	Current school level	Highest educational level obtained	Licensed physical education teacher?
Pilot 2 sample ($N = 31$)							
$M = 36.54$, $SD = 11.69$	35% female	79% White, 8% Hispanic/Latino, 4% African American, 8% other	$M = 8.75$, $SD = 8.28$	Four states represented	8% elementary, 23% elementary/middle, 45% middle/junior high, 23% high school	66% bachelor's degree, 34% advanced degree	92% = yes
Main study sample ($N = 407$)							
$M = 42.16$, $SD = 12.10$	49% female	92% White	$M = 15.03$, $SD = 10.70$	43 states represented	16% elementary, 33% middle/junior high, 35% high, 16% other	39% bachelor's degree, 58% advanced degree, 3% other	97% = yes

five scales were (a) $\alpha_\tau = .842$ (TRI), (b) $\alpha_\tau = .883$ (OBS), (c) $\alpha_\tau = .957$ (COM), (d) $\alpha_\tau = .946$ (SIM), and (e) $\alpha_\tau = .973$ (RAD). For nonadopters, the α_τ nonparametric internal consistency coefficients were (a) $\alpha_\tau = .956$ (TRI), (b) $\alpha_\tau = .721$ (OBS), (c) $\alpha_\tau = .924$ (COM), (d) $\alpha_\tau = .927$ (SIM), and (e) $\alpha_\tau = .982$ (RAD). Some items had very similar wording and were, therefore, very highly correlated (e.g., *A CSPAP has allowed me to promote physical activity more effectively* and *A CSPAP has allowed me to promote physical activity more efficiently*). In such cases, to avoid issues related to high levels of multicollinearity, only the item with the highest factor loading was retained. A total of 16 perceived attributes items were removed based on these results, reducing the total number of perceived attributes items to 84.

In addition, we asked the participants from the second round of pilot testing to retake the survey for the purposes of assessing test–retest reliability. We gave the participants 3 weeks to retake the survey and provided the incentive of having the participants' e-mail addresses entered into a drawing to win a $10 Amazon gift card for completing the survey a second time. A total of 14 individuals retook the survey (nine CSPAP adopters and five potential adopters). For the CSPAP adopters, Cohen's kappa for the survey items ranged between .000 and .294, with a mean estimate of 0.263 and a *SD* of 0.064. For the potential adopters, Cohen's kappa ranged between .000 and .321, with a mean estimate of 0.293 and an *SD* of 0.071. Nevertheless, these low coefficients of stability may be due to the large number of response categories. When we aggregated the survey responses into two categories (0 = *disagree* and 1 = *agree*), all of the values were identical from one administration to another, indicating that none of the respondents drastically changed their response; although the participants may have indicated a slightly different level of agreement or disagreement, no participant changed an agreement to a disagreement or vice versa. Therefore, we made no additional revisions to the survey items, retaining the 84 perceived attributes items, as well as the original items written to measure school context (two items), teacher background (three items), and participant demographics (three items).

Main study. The participants for the main study were 407 physical education teachers (see Table 1 for demographic information). We used a federal website listing all public schools in the United States to identify teachers for the study. Specifically, we used stratified random sampling to select 60 schools (20 elementary, 20 middle/junior high, and 20 high schools) from each state (total of 3,000 schools), visited the school websites to find e-mail addresses (where available) for all physical education teachers at each school, and compiled a list of 2,955 e-mail addresses. Using these addresses, we sent a blanket e-mail, via SurveyMonkey, to physical education teachers, inviting them to participate in the study. The e-mail included a link to the final survey.

We gave the teachers approximately 4 weeks to complete the survey and, as an incentive, told the teachers that if they completed all of the items, their e-mail address would be entered into a drawing to win a $25 Amazon gift card. In addition, we sent four follow-up e-mails (one per week) to maximize the response rate. The 407 respondents represented a 14% response rate. We considered this acceptable for the present study, as a response rate of 10% is usual for online surveys (Manfreda et al., 2008). The time it took for the participants to complete the survey ranged widely from just over 4 min to over a week. Given that physical education teachers often have busy schedules with back-to-back classes and other assigned duties, it is likely that some teachers started the survey on one day and completed it on another day. For the participants who completed the survey in less than 1 hr ($n = 126$), and therefore likely completed the survey in one sitting, the average completion time was 15.27 min.

Data Analysis

We first screened the variables to examine the distribution of the survey data. Although responses of *don't know* were necessary to prevent guessing, forced response choices, or item nonresponse, they could not be used for data analysis because the participants did not have enough information about CSPAP to provide an informed opinion. To avoid losing observations, *don't know* responses were recoded as missing values. The distribution of all missing values ranged between 0.0% and 0.7% and were distributed completely at random based on Little's missing completely at random test, $\chi^2(492) = 469.421$, $p = .761$; therefore, the missing values were imputed with the series mean. We then examined the distribution of each survey variable by computing the item response means and *SD*s.

Exploratory Structural Equation Modeling. Although DOIT is an established theory, it has not been applied to the investigation of physical education teachers' adoption of CSPAPs. Therefore, exploration of the factor structure constituted an important initial step in model testing. We used the exploratory structural equation modeling (ESEM) framework to examine the common factors underlying the survey data. This approach allows for the estimation of an exploratory measurement model with rotations and yields a realistic representation of the data by allowing item cross-loadings. ESEM includes the methodological advances of confirmatory factor analysis and allows for the inclusion of covariates and the computation of structural coefficients and goodness of fit indices (Marsh, Morin, Parker, & Kaur, 2014; Morin & Maiano, 2011; Morin, Marsh, & Nagengast, 2013). ESEM was employed to overcome the serious limitations of confirmatory factor analysis. With confirmatory factor analysis, the strict requirement of zero cross-loadings may lead to distorted factors, overestimated factor correlations, and distorted structural coefficients (Asparouhov & Muthén, 2009). Especially in the early stages of survey development, items are rarely pure indicators of the corresponding constructs, and nonzero cross-loadings could inflate the associations between the factors and the misspecified cross-loading items. Simulation studies have shown that even small cross-loadings such as .100 should be explicitly taken into account; otherwise, parameters could be inflated or biased (Asparouhov, Muthén, & Morin, 2015).

The 42 survey items were used as input for ESEM. The observed variables were treated as ordered categorical using the mean and variance adjusted weighted least squares estimation method and geomin rotation with the *Mplus* 8.2 software (Los Angeles, CA). The mean and variance adjusted weighted least squares estimation procedure provides more accurate results than either other estimation procedures with small samples or ordinal, nonnormal data (Finney & DiStefano, 2006). Geomin is an oblique rotation procedure; oblique procedures are employed when factors are expected to correlate (Browne, 2001). This expectation was based on the fact that all of the survey items measured aspects related to the adoption of a CSPAP. Furthermore, orthogonal rotation procedures may lead to a loss of information and biased estimates if at least one relationship exists among factors (Fabrigar, Wegener, MacCallum, & Strahan, 1999).

The number of factors to be extracted was determined based on the number of eigenvalues larger than one, the examination of the scree plot, the interpretability of the factor structure, as well as a series of goodness of fit indices: (a) chi-square (χ^2) and its *p* value, (b) χ^2 divided by the degrees of freedom (χ^2/df), (c) root mean square error of approximation and its 90% confidence interval, (d) comparative-fit index, (e) Tucker–Lewis index, (f) standardized root mean square residual, and (g) weighted root mean residual.

The χ^2 statistic is an omnibus measure of model fit, with nonsignificant values indicating good fit (Barrett, 2007). This statistic is, however, likely to be inflated under conditions of nonnormality and with larger models; therefore, the χ^2/df is often used as a measure of fit, where values lower than 3 indicate good fit (Finney & DiStefano, 2006). For the root mean square error of approximation and standardized root mean square residual, values lower than .05 indicate excellent fit, values between .05 and .08 indicate good fit, and values between .08 and .10 indicate acceptable fit, whereas values above .10 indicate poor fit (Hu & Bentler, 1999). For the comparative-fit index and Tucker–Lewis index, values larger than .90 indicate good fit, whereas values above .95 show excellent fit (Hu & Bentler, 1999). For the weighted root mean residual index, values lower than 1 indicate good fit (DiStefano, Liu, Jiang, & Shi, 2018; Yu & Muthén, 2002).

The final model included only items with loadings above .320 (Costello & Osborne, 2005). Furthermore, the final solution did not include any free-standing items, cross-loadings larger than .320, or items with nonsignificant loadings ($\alpha = .05$).

As previously indicated, we asked survey participants ($N = 407$) to indicate whether a CSPAP was currently implemented at their school. We coded the responses to this item using the binary variable implementation (1 = *yes* and 0 = *no*). Based on these responses, we assigned the participants to either Group 1 (impl = 1, $n = 290$) or Group 2 (impl = 0, $n = 117$) and estimated the model separately with each group (Models 1 and 2).

To examine the measurement invariance of the five-factor model across the CSPAP adopters and potential adopters, the researchers conducted a series of tests of invariance using the *Mplus* 8.2 software. The variables were weighted to account for the disproportionality of the two groups and were treated as ordered categorical. Models were estimated using the mean and variance adjusted weighted least squares procedure with theta parameterization (Muthén & Asparouhov, 2002). The order of the invariance routine was based on recommendations by covariance modeling researchers (Bialosiewicz, Murphy, & Berry, 2013; Cheung & Rensvold, 2002; DiStefano, Mîndrilă, & Monrad, 2013; Finney & Davis, 2003). First, configural invariance was examined to determine whether participants associated the same sets of items with the same CSPAP constructs. This model had no equality constraints, and all of the model parameters were left free for estimation. Second, the metric invariance was examined by constraining all item loadings to be equal across groups. Third, the factor variances were constrained to be equal across the two groups to determine whether the range of factor scores on the CSPAP factors varied significantly across the adopters and potential adopters (Finney & Davis, 2003). Finally, the test of equal item variances was conducted. Although many researchers consider this test to be too rigorous (Byrne, 1998; Vandenberg & Lance, 2000), it helps determine whether uniqueness terms differ significantly across groups.

We then estimated the model with the entire sample, using the same estimation procedure (Model 3). After reaching an optimal factor structure, we included the implementation variable as a covariate on the identified factors. This is a multiple indicator multiple cause model (MIMIC model), which helps determine whether the identified factors vary significantly across the two groups.

Results

Most of the respondents provided high ratings on all survey items (see Table 2). The item with the lowest ratings was from the TRI scale (*I was/would be able to implement a CSPAP on a trial basis*," $M = 4.00$, $SD = 0.84$), whereas the item with the highest rating was from the OBS scale (*I can/would be able to see the effects of promoting physical activity*, $M = 5.31$, $SD = 0.78$).

With each group, we estimated solutions with four to six factors. For both groups, we considered a five-factor solution to be optimal and obtained the same factor structure. Goodness of fit indices (see Table 3) showed that this model had an overall good fit for both groups, with a slightly better model fit for Group 2. The five-factor model was tested for invariance across the adopters and nonadopters. The results from the invariance testing showed that all of the models had a good fit to the data, and the changes in model fit were minimal and not statistically significant as more restrictions were imposed (see Table 4).

Table 2 Distribution of Survey Responses

	M	*SD*
I am (would be) able to observe what others in my school environment do to promote physical activity.	4.63	1.026
Others in my school environment are (would be) aware that physical activity is being promoted.	5.12	0.814
Others in my school environment are (would be) able to observe our students being physically active.	5.07	0.887
I can (would be able to) see the effects of promoting physical activity.	5.31	0.778
Others in my school environment (would) notice the impact of promoting physical activity.	4.88	0.831
My principal is (would be) able to observe the results of the program.	4.99	0.895
Changes in students' physical activity are (would be) obvious to their parents.	4.50	0.922
Other teachers at my school are (would be) able to observe the results of providing the program.	4.64	0.936
It is (would be) easy for me to promote physical activity with a CSPAP.	4.81	0.767
The process of implementing a CSPAP was (is) clear and understandable for me.	4.58	0.869
It was (would be) easy for me to assume the responsibilities needed to implement a CSPAP.	4.53	0.874
Learning to implement a CSPAP was (would be) easy for me.	4.67	0.812
I (would have) had no difficulty understanding how to implement a CSPAP.	4.57	0.859
The procedures for implementing a CSPAP were (are) straightforward.	4.49	0.862
There was (is) minimal need for me to receive additional training to implement a CSPAP.	4.17	1.006
A CSPAP is not very complicated.	4.53	0.780
It is (would be) easy to coordinate the work needed to implement a CSPAP.	4.31	0.890
The concept of a CSPAP is easy to grasp.	4.79	0.721
A CSPAP fits (would fit) right into the way I like to perform my job.	5.00	0.728
Using a CSPAP is (would be) compatible with all aspects of my work.	4.91	0.756
Using a CSPAP is (would be) compatible with my current professional situation.	4.91	0.802
A CSPAP fits (would fit) well with the way I like to promote physical activity.	5.09	0.658
Providing a CSPAP is consistent with my priorities as a teacher.	5.05	0.696
Providing a CSPAP is compatible with my educational philosophy.	5.12	0.656
Implementing a CSPAP aligns with my educational goals for students.	4.87	0.709
Implementing a CSPAP helped (would help) me to reach my goals as a teacher.	4.20	0.920
I was (would be) able to implement a CSPAP on a trial basis.	4.00	0.836
I had (would have) opportunities to try out various aspects of a CSPAP before fully implementing the program.	4.32	0.780
It was (would be) okay for me to try providing a CSPAP on a limited basis before fully implementing it.	4.18	0.864
I was (would be) able to experiment with implementing a CSPAP to see if I like it.	4.16	0.824
There were (would be) no issues with implementing parts of a CSPAP on a limited basis before implementing the whole program.	4.43	0.645
Implementing a CSPAP has proven (would prove) to be a more cost-effective strategy to promote physical activity.	4.81	0.615
Implementing a CSPAP yielded (would yield) more benefits to students.	4.64	0.698
Providing a CSPAP has increased (would increase) the positive recognition my school receives.	4.72	0.668
Providing a CSPAP has enhanced (would enhance) my performance as a physical education teacher.	4.53	0.692
Using a CSPAP helped me (would help me) to accomplish professional tasks more quickly.	4.66	0.625
A CSPAP has been (would be) a more convenient way to promote physical activity.	4.76	0.641
A CSPAP has allowed (would allow) me to promote physical activity more efficiently.	4.93	0.790
A CSPAP has given (would give) me greater control over promoting physical activity.	5.00	0.781
A CSPAP has been (would be) a more useful strategy for promoting physical activity.	5.00	0.828
A CSPAP increases (would increase) students' participation in physical activity.	4.94	0.779

Note. CSPAP = comprehensive school physical activity programs.

With the entire sample, the initial run yielded six eigenvalues larger than 1. The scree plot indicated solutions with four to six factors as optimal (see Figure 1). We estimated factor solutions with four to six factors with the entire sample. The optimal solution was selected based on the model fit and the interpretability of the factor structure and included five factors.

All of the items in the five-factor solution had statistically significant loadings well above the cutoff of .320 (Costello & Osborne, 2005). This solution did not include any cross-loadings above .320 or freestanding items; however, items with very similar wording and high correlations with other items were removed, and the final solution retained only 23 items. The same factor structure was obtained with the entire sample, as with Group 1 and Group 2.

Both Model 3 and the MIMIC model had an overall good fit to the data with very slight or no differences in goodness of fit indices (see Table 3). The inclusion of the implementation covariate

Table 3 Goodness of Fit Indices for ESEM Models

Fit index	Model 1 (adopters)	Model 2 (potential adopters)	Model 3 (entire sample)	MIMIC model (entire sample)
χ^2	502.180	226.371	515.894	535.598
df	148	148	148	166
p value	.000	.000	.000	.000
χ^2/df	3.393	1.529	3.486	3.226
RMSEA [90% CI]	.091 [.082, .099]	.067 [.049, .084]	.078 [.071, .086]	.074 [.067, .081]
CFI	.979	.983	.983	.983
TLI	.965	.971	.970	.971
WRMR	.595	.518	.620	.668

Note. *df* = degrees of freedom; MIMIC = multiple indicator multiple cause model; RMSEA = root mean square error of approximation; CI = confidence interval; CFI = comparative-fit index; TLI = Tucker–Lewis index; WRMR = weighted root mean residual.

Table 4 Goodness of Fit Indices for Invariance Testing

Goodness of fit index	Configural model (free form)	Metric model (factor loadings)	Strict model (factor variances)	Strict model (item error variances)
χ^2	3,276.600	3,308.066	3,253.233	3,411.630
df	1,702	1,739	1,748	1,776
p value	.000	.000	.000	.000
χ^2/df	1.925	1.902	1.861	1.920
Chi-square contribution from each group				
Potential adopters	1,766.448	1,768.965	1,773.105	1,801.430
Adopters	1,510.153	1,539.101	1,462.127	1,610.200
RMSEA [90% CI]	.067 [.064, .071]	.067 [.063, .070]	.065 [.061, .068]	.067 [.064, .071]
CFI	.963	.963	.965	.961
TLI	.962	.963	.965	.963
Chi-square test for difference testing		51.479	15.573	41.140
df		37	9	28
p value		.0688	.0763	.0521
WRMR	.910	.725	.698	.902

Note. *df* = degrees of freedom; RMSEA = root mean square error of approximation; CI = confidence interval; CFI = comparative-fit index; TLI = Tucker–Lewis index; WRMR = weighted root mean residual.

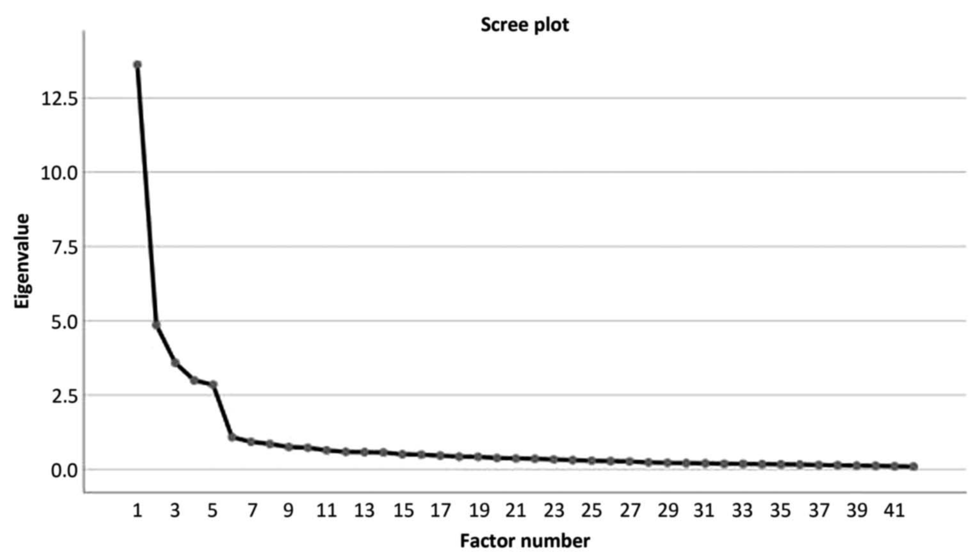

Figure 1 — Scree plot for the entire sample.

slightly improved the χ^2/df, root mean square error of approximation, and Tucker–Lewis index, and slightly increased the weighted root mean residual, whereas the comparative-fit index remained approximately the same. Although the inclusion of the implementation covariate did not drastically change the model fit, the MIMIC model provided information on factor variations across the groups. The factor structure and factor loadings of the MIMIC model are provided in Table 5.

The strongest factor included five items, and we labeled it *COM*. The loadings on this factor ranged between .722 and .960, and the marker item was *A CSPAP fits (would fit) well with the way I like to promote physical activity*. This factor explained 25.37% of

Table 5 Factor Loadings for the MIMIC Model

Item	Estimate	*SE*	Estimate/*SE*	Two-tailed *p* value
Compatibility				
A CSPAP fits (would fit) well with the way I like to promote physical activity.	0.960	0.022	43.002	.000
Providing a CSPAP is consistent with my priorities as a teacher.	0.954	0.021	46.327	.000
Implementing a CSPAP aligns with my educational goals for students.	0.892	0.023	38.695	.000
Implementing a CSPAP helped (would help) me to reach my goals as a teacher.	0.777	0.024	32.392	.000
Using a CSPAP is (would be) compatible with my current professional situation.	0.722	0.032	22.305	.000
Relative advantage				
A CSPAP has given (would give) me greater control over promoting physical activity.	0.952	0.016	58.162	.000
Using a CSPAP has made (would make) promoting physical activity a better experience for me.	0.840	0.019	43.394	.000
A CSPAP increases (would increase) students' participation in physical activity.	0.835	0.018	45.652	.000
Using a CSPAP has helped (would help) me to accomplish professional tasks more quickly.	0.763	0.023	33.540	.000
Providing a CSPAP has increased (would increase) the positive recognition my school receives.	0.622	0.027	22.692	.000
Observability				
Others in my school environment (would) notice the impact of promoting physical activity.	0.854	0.020	43.472	.000
Other teachers at my school are (would be) able to observe the results of providing the program.	0.784	0.025	31.270	.000
My principal is (would be) able to observe the results of the program.	0.760	0.027	28.574	.000
I am (would be) able to observe what others in my school environment do to promote physical activity.	0.715	0.030	24.150	.000
Changes in students' physical activity are (would be) obvious to their parents.	0.668	0.032	20.768	.000
Simplicity				
A CSPAP is not very complicated.	0.840	0.023	36.938	.000
The process of implementing a CSPAP was (is) clear and understandable for me.	0.819	0.024	34.719	.000
It is (would be) easy for me to assume the responsibilities needed to implement a CSPAP.	0.749	0.026	28.561	.000
It is (would be) easy to coordinate the work needed to implement a CSPAP.	0.609	0.033	18.303	.000
There was (is) minimal need for me to receive additional training to implement a CSPAP.	0.590	0.033	17.802	.000
Trialability				
I was (would be) able to implement a CSPAP on a trial basis.	0.960	0.014	70.545	.000
I had (would have) opportunities to try out various aspects of a CSPAP before fully implementing the program.	0.812	0.022	36.164	.000
It was (would be) okay for me to try providing a CSPAP on a limited basis before fully implementing it.	0.800	0.018	45.044	.000

Note. MIMIC = multiple indicator multiple cause model; *SE* = standard error; CSPAP = comprehensive school physical activity programs.

the variance and had an internal consistency of α = .930. The second factor included five items and was labeled *RAD*. The factor loadings for RAD ranged between .622 and .952, and the marker item was *A CSPAP has given (would give) me greater control over promoting physical activity*. RAD explained 22.16% of the variance and had an internal consistency of α = .871. The third factor included five variables, and we labeled it *OBS*. The factor loadings for OBS ranged between .668 and .854, and the marker item was *Others in my school environment (would) notice the impact of promoting physical activity*. OBS explained 19.46% of the variance and had an internal consistency of α = .843. The fourth factor included five items, and we labeled it *SIM*. The loadings for SIM ranged between .590 and .840, and the marker item was *A CSPAP is not very complicated*. SIM explained 17.96% of the variance and had an internal consistency of α = .865. We labeled the fifth factor *TRI*. It included three items with loadings between .800 and .960. The marker item for TRI was *I was (would be) able to implement a CSPAP on a trial basis*. TRI explained 15.02% of the variance and had an internal consistency of α = .890.

As indicated in Table 6, all of the factor covariances were statistically significant. The strongest relationships were COM–SIM and COM–RAD, whereas the weakest relationships were OBS–TRI and RAD–TRI.

Only two of the relationships between the implementation covariate and the factors were statistically significant (see Table 7). A very strong, positive relationship was recorded between implementation and SIM (parameter estimate = 1.170, $t = 9.196$, $p = .000$). In contrast, a weak negative relationship was recorded between implementation and TRI (parameter estimate = –0.132, $t = -1.049$, $p = .000$). This means that being an "adopter" is a significant predictor of higher scores on the SIM factor and of lower scores on the TRI factor.

The mean factor scores by group are reported in Figure 2. The individuals in Group 2 had close to average factor scores on all of the factors, whereas individuals in Group 1 had significantly higher factor scores than individuals in Group 2 on the SIM factor, $t(405) = 11.725$, $p = .000$, and significantly lower scores on the TRI factor, $t(405) = -3.155$, $p = .002$. In conclusion, the adopters' and nonadopters' responses did not vary significantly on the COM, RAD, and OBS factors; however, the adopters perceived significantly higher levels of CSPAP SIM and significantly lower levels of CSPAP TRI.

Discussion

Within a DOIT framework, the aims of this study were to (a) develop a survey to measure physical education teachers' perceived attributes of a CSPAP and (b) use the survey to compare adopters' and potential adopters' perceived attributes of CSPAPs. Little is known about physical education teachers' perceptions of CSPAPs, although recommendations for program adoption frequently identify physical education teachers as leaders in the adoption process (e.g., Beighle, Erwin, Castelli, & Ernst, 2009; Carson, 2012; Carson, Castelli, Beighle, & Erwin, 2014; Heidorn & Centeio, 2012). Given the predictive value of perceived attributes in the adoption of innovations (Rogers, 1995), research on physical education teachers' perceived attributes of CSPAPs

Table 6 Factor Covariances

	Estimate	*SE*	*SE* est./*SE*	Two-tailed *p* value
OBS–SIM	0.367*	0.045	8.352	.000
COM–OBS	0.383*	0.039	9.825	.000
COM–SIM	0.469*	0.033	14.048	.000
RAD–OBS	0.202*	0.050	4.067	.000
RAD–SIM	0.256*	0.042	6.111	.000
RAD–COM	0.439*	0.034	12.876	.000
TRI–OBS	0.158*	0.049	3.229	.000
TRI–SIM	0.401*	0.037	10.686	.000
TRI–COM	0.359*	0.035	10.274	.000
TRI–RAD	0.179*	0.038	4.757	.000

Note. OBS = perceived observability; SIM = perceived simplicity; COM = perceived compatibility; RAD = perceived relative advantage; TRI = perceived trialability.
*Significant at 5% level.

Table 7 Parameter Estimates for the Relationship Between the Implementation and the Five Factors

	Estimate	*SE*	*SE* est./*SE*	Two-tailed *p* value
Implementation->OBS	–0.132	0.126	–1.049	.294
Implementation->SIM	1.170*	0.127	9.196	.000
Implementation->COM	0.138	0.127	1.086	.277
Implementation->RAD	0.164	0.144	1.138	.255
Implementation->TRI	–0.291*	0.136	–2.138	.032

Note. *SE* = standard error; est. = estimate; OBS = perceived observability; SIM = perceived simplicity; COM = perceived compatibility; RAD = perceived relative advantage; TRI = perceived trialability.
*Significant at 5% level.

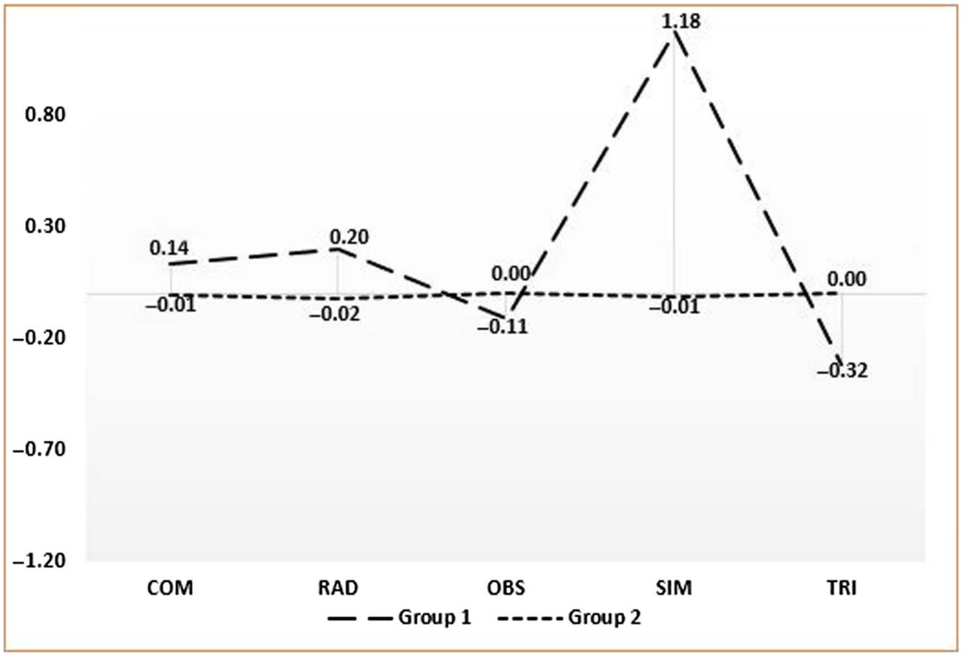

Figure 2 — Mean factor scores by group. COM = compatibility; RAD = relative advantage; OBS = observability; SIM = simplicity; TRI = perceived trialability.

constitutes an important preliminary step in building the knowledge base needed for optimum program design and teacher professional learning initiatives related to CSPAPs.

Regarding the first aim of this study, the results provide initial evidence of instrument validity. We identified a factor structure that has good fit to the data and is consistent across both adopters and potential adopters. Our instrument development procedures, including an extensive literature search, two pilot tests to content validate the survey, and the use of ESEM, allowed us to identify the items that best measure each perceived attribute, yielding a parsimonious and practical measure for continued research within this area of focus. Given an uninterrupted 15–20 min, most physical education teachers should be able to complete the survey, including sections of the survey that were not used for the present study but would be of interest to researchers wishing to investigate other relevant variables (e.g., perceived school support for CSPAP, domain-specific innovativeness of adopters and potential adopters) in physical education teachers' adoption of CSPAPs.

Furthermore, this study provides preliminary findings concerning the relationships between the five perceived attributes of DOIT within a novel context. To the best of our knowledge, this is the first study to examine physical education teachers' perceived attributes of CSPAPs. Consistent with DOIT (Rogers, 1995, 2002) and related research on elementary classroom teachers' perceived attributes of CSPAPs (e.g., Webster et al., 2013), the relationships between all of the factors were statistically significant. The particularly strong relationships of perceived COM with perceived SIM and perceived RAD suggest that physical education teachers appraise CSPAPs in a way that closely interconnects these perceived attributes. Thus, persuasive messaging about CSPAPs, such as that used in professional development with physical education teachers, might emphasize these connections (e.g., explain that the compatible aspects of a CSPAP also make program implementation easier and more advantageous for teachers) to increase teachers' rate of adoption. On the other hand, the weaker relationships of perceived TRI with perceived OBS and perceived RAD suggest that physical education teachers may somewhat disassociate TRI with OBS and RAD. Teachers may believe that they can experiment with a CSPAP in ways that are not necessarily obvious or noticeable to certain people (e.g., administrators, classroom teachers, parents) and that TRI is not necessarily an advantage when implementing a CSPAP.

With respect to the second aim of this study, latent mean differences across groups were found for perceived SIM and perceived TRI. The results showed that the physical education teachers who had already adopted a CSPAP had significantly higher ratings on the items measuring perceived SIM than the physical education teachers who had not yet adopted a CSPAP. Prior to adopting a CSPAP, physical education teachers might perceive more areas of divergence than alignment with respect to the knowledge, skills, and professional responsibilities involved with teaching physical education when compared with promoting PA via other strategies (e.g., involving classroom teachers, administrators, parents, and community organizations in PA promotion; supporting before and after school program staff in providing increased PA opportunities). Available evidence suggests relatively few physical education teachers are engaging in CSPAP professional learning opportunities (Carson et al., 2014) and limited CSPAP training is occurring in preservice physical education teacher education programs (Webster et al., 2016). It is important that CSPAP professional development and training be more widely promoted and disseminated, and help physical education teachers identify various ways their knowledge and skills in planning, management, instruction, and assessment can transfer to their involvement in multiple aspects of a CSPAP. It is encouraging to find that physical education teachers who have already adopted a CSPAP see it as a relatively simple initiative, as this could foster sustainable programming. Moreover, having these teachers present at professional development workshops for potential adopters could help to persuade potential adopters that a CSPAP is less complex than it might seem.

Despite finding a CSPAP to be simpler than they might have thought before adopting one, the adopters perceived a more limited degree of TRI in adopting a CSPAP than the potential adopters did. Adopters may find that for a CSPAP to achieve both of the major goals specified in the survey (i.e., ensure all students receive quality educational experiences promoting lifelong PA participation *and* accumulate 60 min of mostly moderate-to-vigorous PA each day), implementation strategies must be multifaceted, interconnected, and coordinated from the program's inception. It is important to help teachers understand that, although collaboration and synergy are keys to a successful CSPAP, it may make sense in certain instances to focus on only one program goal at a time. Building the program can be approached in a step-by-step manner that allows for gradual growth, capacity building, and institutionalization.

This study has several limitations. Despite the initial evidence of the validity of the survey developed for this study, additional research replicating this study with another sample of physical education teachers is needed to further validate the measurement model. Also, the online administration of the survey was a likely contributor to the low response rate. Nevertheless, the online platform enabled us to collect data from a randomly selected and nationally representative sample of public schools in the United States. This allows for a high level of confidence that the results are generalizable to the total population of physical education teachers working in public elementary and secondary schools across the country. At the present time, very little national surveillance data are available to inform CSPAP implementation or professional learning initiatives for teachers. The perceptions data reported in this study provide useful information for nationwide efforts to develop CSPAP trainings and continued support that appropriately addresses physical education teachers' (adopters and potential adopters) perceived attributes of CSPAPs. The current study represents an initial stage of instrument development and has an exploratory approach aiming to examine the CSPAP factor structure. Although the same factor structure was obtained across groups, further research is needed to determine whether the parameters of the measurement model vary significantly between CSPAP adopters and nonadopters. Further research should also examine the predictive validity of the survey by examining the relationship between the CSPAP factors and the adoption of a CSPAP.

This is one of the first studies to consider physical education teachers' perceptions of CSPAPs. The evidence from this study suggests that many physical education teachers across the United States, who could face numerous potential barriers to CSPAP implementation (e.g., competing curricular demands, full-teaching schedules, extracurricular duties, and limited professional training related to CSPAPs; Webster et al., 2015), perceive CSPAPs in a favorable light. Almost three quarters of the survey respondents already adopted a CSPAP at their schools. Another key finding in this study is that the adopters and potential adopters perceive certain attributes of a CSPAP differently. This information may enhance efforts to not only increase the rate of CSPAP adoption, but also to extend the lifespan of these programs in schools.

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