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ABSTRACT

This paper summarizes historically separate literatures related to motivation, efficacy, and behavioral analysis in education, with a view toward the potential benefits of pursuing correlational study across these historically separate research domains. It also provides pilot data illustrating the potential appeal of a correlational approach across these traditionally separate educational variables. Six preservice physical educators completed the Teacher Motivation for Teaching in Physical Education (TMT-PE) questionnaire and the Teacher Efficacy Scale (TES) before and after their practice teaching activities. They were also observed during one semester. On the TMT-PE, females showed higher means in both motivating potential score (MPS) and efficacy than males, though there were no significant gender differences in MPS. There was no significant mean difference in MPS between experienced and non-experienced participants. On the TES, females showed higher mean scores than males, though there was no significant mean difference in efficacy. There was no significant correlation between gender and motivation and efficacy. A strong negative correlation was found between motivation and percent of positive feedback used by preservice teachers. There was no significant correlation between motivation and student behaviors. Two appendixes provide the TMT-PE scale and the direct observation category system for teacher behaviors. (Contains 48 references.) (SM)

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The study of motivational factors across a variety of professional situations has provided a rich and productive literature. Over the past decade, efficacy issues have also been relatively thoroughly studied, with important research and development contributions emerging from these efforts, particularly in the education and social sciences. In a separate and traditionally unrelated area, the study of the behavioral dynamics of participants operating in a host of professional situations has provided important information related to how to improve the effectiveness of those professional situations. In addition, the behavioral literature has provided important information related to effective professional skill training, with teacher education providing an exemplar for a variety of professional skill training efforts. What has remained separate across a variety of research-bonded disciplines, however, is how motivational variables, efficacy dynamics, and behavioral practices of practicing professionals may be correlated. If accomplished, some important behavioral indicators of motivation and efficacy levels may be discovered, and a potentially important set of educational principles may emerge in relationship to how one may go about altering motivation and efficacy profiles in behavioral ways. To date, research has been largely separatist across motivation, efficacy, and behavioral interests; and research focus has also been limited to a student or learner focus with respect to motivation and efficacy study.

The first purpose of this paper is, therefore, to summarize the historically separate literatures related to motivation, efficacy, and behavior analysis with respect to education concerns; all with a view toward the potential benefits of pursuing correlational study across these historically separate research domains. The second purpose of this paper is to provide some pilot data to illustrate the potential appeal of a correlational approach across these traditionally separate educational variables. Finally, recommendations and implications for future research to the benefit of a variety of educational, predictive, and control ends are explored.

Motivation Research

For decades researchers in education, sport psychology, and sport pedagogy have used theories of motivation, such as self-efficacy, expectancy value, and goal orientation to understand why some people feel more relatively competent in their professional tasks than others. Relative differences in perceived professional competence have then been explained in terms of relative differences in motivational levels.

According to Pintrich and Schunk (1996), motivation is defined as involving processes that occur as individuals instigate and sustain goal-directed actions. Similar to this definitional foundation, motivation has been predominantly conceptualized in terms of a malleable process susceptible to external influences, rather than a more rigidly categorized end-product (Weiner, 1985). As a process and in relation to research thereof, motivation is not observed directly but rather is typically inferred from overt behaviors and public events such as choice of tasks, relative effort, persistence, and verbalizations related to potential task accomplishment (e.g., "I really want to do this"). A variety of theories have also been posited which contend that motivational variables provide an underlying functional relationship with most human behavior (Weiner; 1985), however, these posits have been little documented and remain largely intuitively or theoretically based. Currently accepted motivational theories also stipulate that motivation dynamics involve goals that provide impetus for, and direction to, action. A paucity of research data exists in verification of specific motivation←→behavior correlations. Instead, a primarily cognitive view of motivation has been developed and is united in its emphasis on the importance of goals. For example, goals may not be well formulated and may change with experience, but the point is that individuals have something in mind that they are trying to attain or avoid and, hence, provide for relative motivation levels for performing particular tasks or professional activities (Pintrich & Schunk; 1996).

A preponderance of education research points to motivational factors as one of the most important qualities that pervade all aspects of the teaching and learning process. As illustration, motivational processes associated with teacher functions of planning and instruction as well as student practices and long-term measures of learning are discussed by Bandura's (1986) theoretical emphasis on reciprocal interactions among cognitions, behaviors, and environmental factors. Bandura provides a conceptual illustration of this dynamic by suggesting that the integral teaching components of planning and decision-making are inextricably related to student achievement, and that both of these teacher and student variables are related to teacher and

student motivational levels for the tasks and activities necessary to perform for success in the teaching-learning setting.

In physical education teacher education (PETE) research, a recognized subset of education research, little attention has been devoted to the study of teacher motivation, whether at pre- or in-service levels of professional practice. In addition, what study has been conducted in relation to motivational dynamics of education settings has focused primarily on student motivation in relation to their relative participation and achievement in skill-learning contexts (Chen, 2001). An area clearly ripe for research and development in the physical education literature relates to the study of teacher and coach motivation levels and a related impact on teacher/coach efficacy and teacher/coach behavioral practice. Pangrazi and Dauer (1995), and Siedentop (1991) have conceptually addressed the potential importance of motivation as a teacher-based factor in ensuring effective instructional practice. A primary recurring and yet unanswered question, however, involves the issue of how teacher motivation levels may affect instructional performance across setting and subject matter; and the differential planning and organizational efforts that are undertaken for that instructional performance in relation to varying motivational profiles.

A review of the PETE literature also reveals that a cognitive measurement scale does not currently exist with respect to the measurement of pre- or in-service physical education teachers' motivation for teaching. When using a parent literature such as organizational management, however, it is hypothesized that motivated teachers may display significant differences when compared with non-motivated teachers on the dimensions of skill variety, task identity, task significance, autonomy, and perceived feedback on their teaching (refer to Hackman & Oldham; 1976). Hackman and Oldham's (1976) Job Description Survey (JDS), for example, has been used and validated with success in business-related settings and has found strong correlations among professional motivation levels and specific professional practices. It is consequently hypothesized that important behavioral (i.e., professional practices of teachers and coaches) correlates may be derived with respect to a variety of motivation typologies if cognitively scaled using Barnabe and Burns' (1994) motivational indicators (based on the original work of Hackman & Oldham; 1976).

This paper provides one example of a Teacher's Motivation for Teaching in Physical Education (TMT-PE) Scale that has been validated and piloted with select pre-service physical education teachers in training. A synthesis of instruments cited, (refer to Appendix A) the proposed scale was developed according to Hackman and Oldham's equally weighted formula

across skill variety, task identity, task significance, autonomy, and feedback on teaching. The proposed TMT-PE scale is a modification of the JDS as suggested by Barnabe and Burns (1994) in relation to ensuring professional practice specificity (i.e., teaching in physical education settings).

Efficacy Research

Over the past decade a growing number of educational researchers have identified teachers' perceived sense of efficacy in teaching and learning situations as a powerful variable the the prediction and control of general teacher effectiveness. In a similar research paradigm as that frequented in the motivation research literature, information is available which demonstrates important relationships between teachers' efficacy beliefs and their perceived relative effectiveness along several dimensions including student achievement (Allinder, 1995; Ross; 1995), student autonomy (Midgley, Feldlaufer, & Eccles; 1988), teacher classroom behavior (Saklofske, Michayluk, & Randhawa; 1988), relative teacher motivation to teach (Ashton & Webb; 1986), and student and teacher task persistence (Schunk; 1991). This substantial body of literature supports Bandura's (1997) conceptual view that teacher efficacy beliefs are strong predictors of teacher motivation and behavior, and as such may contribute in corollary ways to students' learning experiences.

Although modern definitions of teacher efficacy vary, most can be traced to the early research of Heider (1958) or White (1959). In a similar foundational perspective, Denham and Michael (1981) define teacher efficacy as a teacher's level of confidence in his or her ability to promote desired outcomes in teaching. Gibson and Dembo (1984) argue that it may be necessary to further distinguish the general teaching efficacy definition above from a more specific personal teaching efficacy definition as suggested by Bandura's (1977, 1978) conceptualization of self-efficacy. In other words, teachers may believe that certain practices or teaching behaviors will affect student performance (general efficacy) but, at the same time, may not believe they can perform those necessary activities (personal or self-efficacy). Researchers in this area have predominantly linked the construct of teacher efficacy to Bandura's (1977) larger theory of self-efficacy. According to Bandura, two types of expectations determine human behavior as follows: (a) an expectation that a certain behavior will lead to a certain outcome, and (b) an expectation that one can perform the required behavior in order to bring about the desired outcome.

Ashton and Webb (1982) were among the first researchers to apply Bandura's social learning theory to the study of teacher efficacy. They employed a measure of teacher efficacy developed by the Rand Corporation (Berman & McLaughlin, 1977) to assess two dimensions of the construct. In their research, teacher interview and correlation data provided support for at least two different efficacy dimensions – general teaching efficacy and personal teaching efficacy. However, attempts to develop more sophisticated or sensitive measures of teacher efficacy than the two items used in the studies by Berman and McLaughlin (1977) have been lacking.

One exception that provides example of extending the work of Ashton and Webb is that of Gibson and Dembo (1984). They developed a scale to measure two dimensions of teacher efficacy that had been identified previously using a multi-element questionnaire technique. Gibson and Dembo (1984) attempted to identify teacher efficacy as a variable accounting for individual differences in teaching effectiveness through the use of a 30-item Teacher Efficacy Scale (later reduced to 16 items, based upon factor analysis). Results revealed two substantial factors, called teaching efficacy (similar to Bandura's outcome expectation dimension) and personal efficacy (similar to Bandura's efficacy expectation dimension), to represent generalized beliefs about whether teachers can make a difference and individualized beliefs about whether the particular teacher completing the scale can make a difference in the lives of students. In this line of work it was concluded that a teachers' sense of efficacy was one of the best predictors of the "percentage of goals achieved, amount of teacher change, improved student performance, and continuation of both project methods and materials" (Dembo & Gibson, 1985, p. 173).

Some studies have also shown that teacher efficacy is more likely to increase during the period of pre-service training, particularly during involvement in the first practice teaching experiences (Hoy & Woolfolk, 1990). In addition, research has shown that teacher efficacy is more likely to be stable among in-service teachers with some decline in both personal and general efficacy the longer a teacher professional remains in the profession (Guskey & Passero, 1993). Furthermore, a growing data-base is available that links the development of teacher efficacy to such school context variables as the achievement levels of students, academic climate, interaction among colleagues, and the interaction effects of different grade levels (Bandura, 1993, 1997).

Though the construct of teacher efficacy in relation to the propensity for certain teacher practices to be manifest, and in relation to other classroom setting variables, has been an important topic of research in the mainstream teacher education literature, little research specific

to physical education teacher education (PETE) settings has been conducted. One may logically infer that the dimension of teacher or coach efficacy would play an important functional role given the emphasis on the directly observable aspects of athletic performance that are inherent to effective structured physical education and sport related instructional settings. In this respect, potentially important information may gained from the study of whether and under what conditions pre- and in-service physical education teachers become effective instructors with regard to correlations among efficacy, motivation, and behavioral variables extant to those particular instructional settings.

Applied Behavior Analysis

The direct observation of teacher and student behaviors in specific educational settings has experienced a long and productive tradition in a variety of sub-disciplines existing within the general education research literature. One of these areas receiving great attention is physical education teacher education (see for example, Darst, Zakrajsek, & Mancini; 1989). Generally, and across sub-disciplines, traditional behavior analyses have contributed in a host of ways including contributions to general instructional practices and procedures (e.g., Ingham & Greer, 1992; Kamps, Leonard, Dugan, Boland, & Greenwood, 1991), specific instructional principles (e.g., Cooper, Thomson, & Baer, 1970; Feiman-Nemser & Floden, 1986; Page, Iwata, & Reid, 1982), and the remediation of specific client challenges (e.g., Bellack & Hersen. 1979). Within this literature, behavior analysis in education has proven a productive research and development approach across a host of subject matters (e.g., math to science to reading to physical activity), and a range of client characteristics (e.g., primary to secondary to postsecondary to special populations).

Using the physical education teacher education literature as an illustration, much of the early behavior analysis research efforts in education were descriptive in nature (e.g., Anderson & Barrette, 1978). Historical efforts in this genre were focused on descriptions of the effective and not-so-effective practices of teachers and students in particular instructional ecologies, without effort toward constructing causal or correlational relationships among behaviors and events in those ecologies. A next stage of behavior analysis research in education, and again using the physical education teacher education literature as illustration, focused on a range of questions designed to discover how specific teacher practices might be correlated with the productive change in student behavior (e.g., Ward, Smith, & Sharpe, 1997), how general instructional

strategies might impact on student learning (e.g., Goldberger, 1991), and on the potential correlations among select teacher and student behaviors and presage variables that are manifest in certain instructional settings (e.g., Silverman, 1991). The physical education teacher education literature also provides important illustration of how behavior analysis methods have been documented as productive in the feedback and goal-setting process of preparing undergraduates toward effective teaching practice in peer- and practice-teaching settings (e.g., Mancini, Wuest, & van der Mars, 1985).

Unique to the physical education teacher education literature is the contemporary contribution of field systems analysis, or more recently termed sequential behavior analysis (SBA), to the larger research-on-teaching literature. In this method, attempts are made through appealing computer technologies to provide sophisticated behavioral data collection and analysis toward (a) more complete topographic description of the many behavior and event occurrences extant to complex, multiple participant educational settings; and (b) more explicit focus on the sequential, or time-based connections and related functional relationships among behaviors of teacher(s) and student(s) (e.g., Sharpe, 1997). In addition, and through SBA implementation, explicit focus on the multiple interactions among teachers and students in situational context, and quantification of these relationships using conditional probability matrices, provides a sophisticated procedure for the explicit quantification of teacher and student behavioral relationships, previously unavailable through more traditional behavior analysis methodologies (e.g., Sharpe, Hawkins, & Ray, 1995).

Essentially, a sequential analysis is designed to overcome the traditionally fragmented process of behavior analysis in which isolated teacher events that presumably affect student practices or student achievement in some mechanistic or additive way are oftentimes inappropriately aggregated over time in the context of specious causal relationships (Sharpe, Lounsbery, & Bahls, 1997). Stated in behavioral terms, a sequential behavior analysis attempts to "discover" or "understand" the temporal relationships among teacher and student behaviors in particular contexts in an effort to move well beyond simple descriptive demonstration (Morris, 1992, p. 9).

Sharpe (1997) and Sharpe, Hawkins, and Lounsbery (1998) provide two teacher education examples in the physical education literature which well illustrate the methodological appeal and related interactive focus of SBA. In the context of these examples, suppose a student is off-task in a gymnasium setting. This off-task behavior may be in response to a denied request

of the teacher and it may also act as a stimulus to another student's inappropriate withdrawal from an ongoing activity. In this case, it would not be enough to merely count up the number of off-task episodes to provide a clear and accurate picture of the instructional setting. Even if one measures the use of a teacher intervention such as positive verbal praise or time-out designed to curtail the off-task episodes, a functional relationship between this teacher practice and student off-task is not explicitly measured, unless these teacher and student behaviors are measured relative to how they interact over time. What is necessary is a measure of the probability with which certain teacher and student behaviors occur in time-based proximity to a target behavior of interest (in this example, off-task) to effectively and appropriately ascertain the relevant functional or causal relationships and the consequent development of treatments designed to successfully and effectively extinguish or increase that target behavior (in this case, off-task).

Clearly, the applied analysis of behavior as a thoroughgoing methodology to be used in the study and evaluation of complex education settings is evolving in concert with important an impacting educational questions. Given the availability of complex and inclusive descriptive capabilities of emergent strategies and tactics akin to that which SBA methods provide, arguments in favor of a correlational approach to the study of motivation, efficacy, and behavioral determinants of effective pedagogical practice are quite appealing from both feasibility and knowledge to be gained perspectives.

A Pilot Illustration

To fully illustrate the potentiality of correlating traditionally separate research efforts in the areas of motivation, efficacy, and applied behavior analysis, a pilot study illustration is in order. In the following pilot detailed, descriptive efforts were undertaken to use a validated cognitive measure of motivation and efficacy (Refer to Appendix A) in the context of collecting daily teacher and student practice data on a cohort of pre-service teacher trainees operating within a practice teaching experience during a culminating advanced undergraduate instructional methods capstone course experience.

Participants and Setting

This pilot was conducted at a large comprehensive University, characterized by a heterogeneous mixture of ethnic groups, socioeconomic backgrounds, and academic achievement levels. A total of six (3 male, 3 female) Physical Education pre-service teachers in training were

selected to participate in the study. Participants were purposefully selected for observation based on similar past experiences, similar GPAs, and all participants practice teaching a similar sequence of subject matter in a similar manner (i.e., skill-based instruction with culminating game play) in a professional training setting. Instruction took place in either an indoor gymnasium or an outside playing field, and consisted of class sizes ranging from 10 to 15 students of similar introductory ability levels.

Cognitive Measures

Motivation questionnaire. The Teacher Motivation for Teaching in Physical Education (TMT-PE) questionnaire was administered to each participant. The TMT-PE consisted of a total of 10 items. Each of five core dimensions (i.e., skill variety, task identity, task significance, autonomy, job feedback) were measured by two items of seven-point Likert-type response scales that were used throughout the instrument (1=low, 7=high) (Refer to Appendix A).

Efficacy questionnaire. A Teacher Efficacy Scale (TES) developed by Gibson and Dembo (1984) was used for measuring preservice physical education teacher efficacy. The TES contained 16 items and each item is rated on a 6-point Likert scale from strongly agree (5) to strongly disagree (1) (Refer to Appendix A).

Behavioral Measures

A mutually exclusive and behaviorally inclusive observational coding scheme was developed and implemented to record a descriptive profile of what each teacher, and their students, actually did during each practice teaching episode. The coding scheme was designed to include all practices and activities that each teacher and their respective students would conceivably be involved in. A complete accounting of behavioral terms and definitions is contained within Appendix B.

Data Collection Procedures

TMT-PE and TES were administered at the beginning of the semester and prior to actual practice teaching activities and teacher-in-training participation. Participants were assured answer confidentiality and all human subjects review protocols were followed. It was also emphasized to each participant the importance of reading each item carefully before marking in any of the

statements and to think about how well each statement described their teaching motivation and efficacy in their practice teaching experiences.

All pre-service teachers involved in this pilot were observed during their one fall-semester practice teaching demonstration lesson using the behavioral systems observational coding scheme developed and illustrated in the work of Sharpe and Koperwas (2000) and contained in Appendix B of this paper. Observational data collection was conducting using a computer-based real-time recording system termed Behavior Evaluation Strategies and Taxonomies (BEST) and authored by Sharpe and Koperwas. Statistical analysis for this pilot included the number of occurrences and total percentage of class time for each teacher and student behavior contained in the observational code. An IBM ThinkPad I-Series computer was used to implement the direct observation software tools used to collect and analyze the data. All behavioral data were collected in real-time, ensuring a complete teacher behavior data record for the teacher encompassing the entire demonstration lesson class period, and ensuring a representative student behavior data record of the larger class composite through accepted moment-to-moment rotational recording techniques (Refer to Sharpe and Koperwas, 2000 for a complete discussion of direct observation recording issues and procedures). Obserational protocol also followed a feedback and goal-setting discussion among data collectors and pre-service teacher trainee immediately following each demonstration lesson. Within each post-teaching practice discussion, specific and constructive critical analyses were provided based specifically on the behavioral data representations.

Direct observation reliability. Two volunteer data collectors were trained through 15-20 hours of practice and instruction on the observational coding system and related computer-based data collection and analysis tools. Ensuring reliability of the data included three steps of (a) developing a criterion tape standard, (b) training data collectors to that standard, and (c) conducting interobserver reliability checks at periodic intervals during the pilot study to ensure experimental reliability. Based on Kazdin's (1982) experimental protocol, agreement checks were made twice per month over the course of the one semester pilot study duration. Cohen's Kappa (Cohen, 1960) was used to mathematically assess reliability for all three steps and was implemented as part of the computer-based software program used for data collection and analysis purposes. Mean reliability quotients for all three stages was .94 with a range of .82 to 1.00, well above the minimum recommended reliability quotient of .85.

Data Analysis

Both survey and questionnaire data were analyzed according to accepted qualitative synthesis techniques, (Denzin & Lincoln, 2000) and then correlated with the behavioral data collected to search for generalized correlational patterns. In addition, t-tests were conducted to examine the differences between gender and experience of the pilot study participants and varying levels of motivation and efficacy. A Pearson product moment coefficient of correlation (γ) was also used to examine the relationships among select cognitive and behavioral variables identified in the pilot study measures.

Results

Characteristics of pilot study participants. Table 1shows the characteristics of all pre-service teacher trainees who participated in this study. The mean age of participants was 26.7, a variety of prior formal teaching experiences were in evidence, and an equal gender mix was evident.

Table 1. Characteristics of participants (N =6).

Participants	Gender	Age	Type of Service	Teaching Experience	Type of Experience
Participant 1	Male	41	Preservice	None	Boxing, football
Participant 2	Male	24	Preservice	None	Boy scouts
Participant 3	Male	22	Preservice	1-2 years	Track
Participant 4	Female	21	Preservice	None	Basketball
Participant 5	Female	24	Preservice	None	Substitute teacher
Participant 6	Female	28	Preservice	Over 3 years	Substitute teacher

Teacher motivation data. Using the Teacher Motivation for Teaching in Physical Education (TMT-PE) questionnaire and based on the empirical assessment of the Job Characteristics Model cited, five core motivation characteristics were combined into a single index of a motivating potential score (MPS) that reflected the overall potential of teaching to influence the individual participant's feelings and behaviors. The formula used for the MPS was as follows:

$$MPS = \frac{(Skill\ variety + Task\ identity + Task\ significance)}{3} \times (Autonomy) \times (Job\ feedback)$$

Female participants showed higher means both in MPS and efficacy than male participants. However, as illustrated in Table 2, there was no statistically significant gender difference in MPS, $t(4) = -1.60$, $p > .05$. Further analysis also found that there was no significant mean difference in MPS between experienced (N = 2; $M = 1841.3$, $SD = 906.9$) and non-experienced participants (N = 4; $M = 1413.0$, $SD = 361.4$), $t(4) = -.90$, $p > .05$.

Table 2. Motivating potential score (MPS) and teacher efficacy for each gender and participant.

	MPS		EFFICACY	
	M	SD	M	SD
Males (N = 3)	1248.0	267.3	65.7	6.7
Females (N = 3)	1863.6	611.5	66.3	3.1
T-value	*t(4) = -1.60, p = .19*		*t(4) = -1.58, p = .89*	
Male				
Participant 1	1008.00		60.00	
Participant 2	1536.00		64.00	
Participant 3	1200.00		73.00	
Female				
Participant 4	1848.00		63.00	
Participant 5	1260.00		69.00	
Participant 6	2482.67		67.00	

Teacher efficacy. Again, teacher efficacy was measured using a Teacher Efficacy Scale (TES), consisting of 16 items on a 6-point Likert scale. Table 2 also shows the efficacy scores for each pilot study participant which were obtained by summing responses of the 16-items on the TES. As the table shows, females showed a higher mean score in the TES than males. However, there was no significant mean difference in efficacy between male and female participants, $t(4) = -1.58$, $p > .05$.

Correlations among motivation and efficacy. A Pearson product moment coefficient of correlation (γ) was also calculated in order to examine the relationship between preservice teachers' motivation and efficacy, given that these two measures are often overlapped in the research literature. No statistically significant correlation between the two variables was found, $\gamma = .25$, $p > .05$. Further analyses were also conducted to examine the relationship between characteristics of participants, and motivation and efficacy. A negative correlation between motivation and age, $\gamma = -.40$, $p < .05$, was found in support of prior research in this area. In addition, a high negative correlation between efficacy and age was also found, $\gamma = -.60$, $p < .05$. No statistically significant correlation was found between gender and motivation ($\gamma = .15$, $p > .05$) and efficacy ($\gamma = .08$, $p > .05$).

Behavioral data. Number and percent of all teacher and student behavior data are summarized in Table 3. Participant 1 showed a high number of positive feedback and a high percentage of modeling in his boxing lesson. Students in his class were highly engaged in a given activity. Participant 2 implemented a lot of specific observation and a high percentage of verbal instruction. Students in his class spent lots of time in cognitive activity. Participant 3 showed an extremely high number and percentage of general observation in his teaching. Student motor engagement was extremely high with 86% of a total of student behaviors.

Table 3. Number and Percent of Preservice Teachers' Teaching and Students' Behaviors.

Participants	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**
Teaching Units	**Boxing**	**Handball**	**Softball**	**Dance**	**Soccer**	**Soccer**
	N (%)	*N (%)*	*N (%)*	*N (%)*	*N (%)*	*N (%)*
Teaching Behaviors						
General observation	47 (8.71)	13 (5.8)	**29 (62.4)**	9 (8.8)	10 (3.4)	11 (7.8)
Specific observation	42 (6.60)	**34** (29.0)	11 (12.4)	**28** (22.5)	**58** (23.2)	**31 (39.6)**
Encouragement	8 (0.9)	1 (0.1)	1 (0.1)	5 (0.7)	0 (0.0)	0 (0.0)
Positive feedback	**69** (10.4)	18 (3.2)	7 (4.3)	21 (3.3)	47 (7.12)	17 (1.8)
Negative feedback	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (0.1)
Management	18 (11.8)	20 (14.2)	8 (10.5)	15 (17.7)	8 (23.7)	16 (22.3)
Verbal instruction	60 (16.2)	31 (**41.9**)	13 (6.9)	28 (**25.3**)	26 (**26.3**)	26 (23.8)

Modeling	56 (38.7)	8 (3.5)	4 (3.2)	14 (12.8)	5 (6.4)	5 (4.3)
Physical guidance	11 (5.2)	4 (2.2)	0 (0.0)	2 (0.7)	0 (0.0)	1 (0.1)
Interpersonal	5 (1.42)	1 (0.2)	1 (0.5)	8 (1.8)	1 (0.2)	2 (0.3)
Student Behaviors						
Motor engagement	41 (44.0)	8 (15.4)	13 (86.0)	11 (15.0)	15 (15.8)	12 (38.6)
On-task	16 (6.4)	15 (11.5)	1 (14.0)	12 (18.0)	10 (18.9)	8 (7.7)
Off-task	1 (1.9)	1 (0.4)	0 (0.0)	0 (0.0)	1 (0.1)	8 (7.8)
Supportive	2 (0.7)	2 (1.1)	0 (0.0)	7 (13.0)	3 (6.2)	2 (1.9)
Peer instruction	3 (6.8)	7 (6.8)	0 (0.0)	0 (0.0)	0 (0.0)	14 (10.6)
Cognitive	34 (38.4)	19 (52.6)	0 (0.0)	19 (31.3)	13 (34.4)	2 (7.5)
Waiting	4 (2.1)	16 (12.6)	0 (0.0)	14 (23.1)	14 (24.6)	0 (0.0)

Participant 4 showed a high number of specific observations and a high percentage of verbal instruction in her teaching unit. Students' cognitive behavior was greatest in this setting among all student behaviors. Participant 5 showed an extremely high number (n=58) of specific observations and a high percentage of verbal instruction in her teaching. Students showed high numbers of motor engagement and waiting, and a high percentage of cognitive behavior. Last, participant 6 showed a high number and percentage of specific observations in her teaching. Students' motor engagement was high (38.6%) and peer instruction was observed frequently (n=14).

Potential correlations among cognitive and behavioral variables. Correlations between cognitive variables (i.e., motivation and efficacy) and teacher/student behaviors were calculated using a Pearson product moment coefficient of correlation (γ), in order to find out how motivation and efficacy measures may be related to select behavioral measures of teacher and student practice. Table 4 illustrates correlations between teachers' motivation and efficacy, and select teacher and student behaviors. Correlations were calculated in terms of number and percent measures of behavioral variables.

As illustrated in Table 4, some statistically significant correlations between cognitive and behavioral variables were found. There was a strong positive relationship between motivation and the number (γ = .79) and percent (γ = .88) of specific observation that was implemented by the pre-service teachers participating in the pilot study. However, a strong negative correlation (γ

= -.78) was found between motivation and the percent of positive feedback used by pre-service teachers. No significant correlation between motivation and student behaviors was found.

As shown and illustrated in Table 4, there were strong negative correlations between teacher efficacy and the number (γ = -.76) and percent (γ = -.78) of teacher encouragement to students. In addition, a significant negative correlation (γ=-.81) was found between teacher efficacy and the percent of physical guidance. Interestingly, a high strong negative correlation (γ = -.92) was found between teacher efficacy and the number of student cognitive behaviors.

Table 4. Correlations between Cognitive and Behavioral Variables.

	Motivation		**Efficacy**	
Teaching Behaviors	*Number*	*Percent*	*Number*	*Percent*
General observation	.17	-.30	.41	.69
Specific observation	.79*	.88**	.07	.11
Encouragement	-.19	-.31	-.76*	-.78*
Positive feedback	-.51	-.78*	.43	-.34
Negative feedback	.08	.12	.11	.14
Management	-.29	.57	-.17	.11
Verbal instruction	.62	.32	.10	-.45
Modeling	.20	-.49	-.44	-.66
Physical guidance	.45	-.47	-.31	-.81*
Interpersonal	.02	.02	.11	.01
Student Behaviors				
Motor engagement	-.51	.34	-.51	.17
On-task	.21	.19	.34	.27
Off-task	.38	.54	-.18	.09
Supportive	.33	.23	.46	.49
Peer instruction	.44	.38	.37	.29
Cognitive	-.39	-.12	-.92**	-.59
Waiting	-.04	.01	-.33	-.21

*$p < .05$. **$p < .01$.

Discussion and Recommendations

From this paper it is clear that we are promoting a hypothesis concerning potentially important and little known correlations among motivation and efficacy measures with respect to practicing teachers, and the behavioral dimensions of their teaching practice and the practices their students are engaged in as a function of that teaching practice. Some surprising findings were reported from our pilot study in relation to this hypothesis, findings that would perhaps not be naturally intuited without the benefit of data familiarity. For example, one would think that high amounts of teacher encouragement and positive feedback would be reflective of a motivated and self-confident teacher, however, the opposite appears to be the case to the point of teachers potentially encouraging students in an effort to find a mechanism of encouragement for themselves. In contrast, the positive correlations among cognitive measures and specific observation, and the negative correlations among physical guidance and efficacy seem intuitively plausible. For example, confident and motivated teachers would logically provide greater attention with respect to particular students in need of instruction and interaction and, conversely, unmotivated and insecure teachers may not be comfortable providing the types of individualized and intensive instruction characteristic of physical guidance behaviors. Clearly additional study of these relationships are warranted well beyond our pilot illustration.

From our discussion, two important recommendations and implications for guiding the research and development process in physical education teacher education are clear. First, a more complete topography of the correlations among motivation and efficacy, and behavioral determinants of effective instructional practice may provide greater understanding into just what constitutes effective pedagogical practice. Such information will lead to what may be most effective in a generalized sense, and what may be more or less relatively effective with certain student types, in what ecologies, and for what subject matters. Equally important, this type of correlational information may have broad implications for the form and structure of teacher education practices. For example, better diagnostic tools may be developed concerning entrance and related predictive success for undergraduates considering matriculation through a particular teacher training program if motivation and efficacy determinants that are highly correlated with effective teaching practices are included. Additionally, and perhaps of greatest import to a thoroughgoing correlational map of effective teaching typologies, interventions and assessment tools may be developed to more effectively alter teacher and student behaviors in such ways as to have a functional impact on the motivation and efficacy dimensions of both teacher and student.

Ultimately, it is this last potential research and development avenue which may go far in improving the current state of intervention research in motivation and efficacy treatments, given the methodological challenges that are inherent to cognitive questionnaire type approaches to description and intervention in this area. With these thoughts we hope to leave readers of our hypotheses and pilot illustrations with impetus for thoroughgoing research and development in what we advocate as an important correlational next step to research and development in education research in general, and physical education teacher education activities in specific.

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Appendix A

TMT-PE (Motivation) and TES (Efficacy) Questionnaires

Teacher Motivation for Teaching in Physical Education (TMT-PE)

Direction: Read each statement, then answer all the questions as best you can – there are no right or wrong answers. Please circle the number that best describes how you feel about each statement. Be sure to choose only one answer for each item. All your responses are strictly confidential.

		Low			Moderate			High
1.	My teaching requires a variety of different activities.	1	2	3	4	5	6	7
2.	My teaching requires the use of a number of different skills and talents.	1	2	3	4	5	6	7
3.	My teaching is organized to cover complete and integrated units of instruction.	1	2	3	4	5	6	7
4.	My teaching is focused on specific skills that are connected to larger unit themes.	1	2	3	4	5	6	7
5.	The results of my teaching have a significant effect on the well-being of students.	1	2	3	4	5	6	7
6.	My teaching ensures that students learn skills important to their life-span development and quality of life.	1	2	3	4	5	6	7
7.	My teaching is designed by my own decisions and I have the freedom to play according to what I feel to be most important to my lessons.	1	2	3	4	5	6	7
8.	Others do not prescribe what I should be teaching for me.	1	2	3	4	5	6	7
9.	After teaching, I receive clear information about the effectiveness of my teaching performance from students and colleagues.	1	2	3	4	5	6	7
10	My immediate supervisors and colleagues provide regular constructive feedback on the relative effectiveness of my teaching practices.	1	2	3	4	5	6	7

Teacher Efficacy Scale (TES)

Direction: Please read each statement carefully and decide how much you agree or disagree with the statement. Using the scale from 1 to 6 described below, please circle the number that best describes how you feel about each statement. Be sure to choose only one answer for each item.

		Strongly Disagree		Slightly Disagree/Agree			Strongly Agree
1.	When a student does better than usual, many times it is because I exerted a little extra effort.	1	2	3	4	5	6
2.	The hours in my class have little influence on students compared to the influence of their home environment.	1	2	3	4	5	6
3.	If students do not receive guidance at home, they aren't likely to accept any guidance.	1	2	3	4	5	6
4.	The amount that a student can learn is primarily related to family background.	1	2	3	4	5	6
5.	When a student is having difficulty with an assignment I am usually able to adjust it to his/her level.	1	2	3	4	5	6
6.	When a student gets a better grade than he usually gets, it is usually because I found better ways of teaching that student.	1	2	3	4	5	6
7.	When I really try, I can get through to most difficult student.	1	2	3	4	5	6
8.	A teacher is very limited in what she/he can achieve because a student's home environment is a large influence on her/his achievement.	1	2	3	4	5	6
9.	When the grades of my students improve it is usually because I found more effective teaching approaches.	1	2	3	4	5	6
10.	If a student masters a new math concept quickly, this might be because I knew the necessary steps in teaching that concept.	1	2	3	4	5	6
11.	If parents would do more with their children, I could do more.	1	2	3	4	5	6
12.	If a student did not remember information I gave in a previous lesson, I would know how to increase her/his retention in the next lesson.	1	2	3	4	5	6
13.	If a student in my class becomes disruptive and noisy, I feel assured that I know some techniques to redirect his/her quickly.	1	2	3	4	5	6
14.	The influence of a student's home experiences can be overcome by good teaching.	1	2	3	4	5	6
15.	If one of my students could not do a class assignment, I would be able to accurately assess whether the assignment was at the correct level of difficulty.	1	2	3	4	5	6
16.	Even a teacher with good teaching abilities may not reach many students.	1	2	3	4	5	6

Appendix B

Direct Observation Category System

Teacher Behaviors

General observation: The teacher is watching student groups engaged in any category of student behavior. This category includes passive supervision, and there is no relationship of the observation to an instructional focus. The teacher must also not be engaged in any other category of teacher behavior in order to record general observation.

Specific observation: The teacher is watching one student engaged in a subject matter task for the purpose of providing feedback related to performance. The teacher position must be proximal to the student position so that observation is clearly focused on a specific student who is performing. Specific observation could also be recorded when the teacher is watching pairs or small groups of students when the instructional focus is clearly on a group task (e.g., observation of five players executing a fast break during instruction on the fast break in basketball).

Encouragement: The teacher makes a verbal statement prior to a student skill or organizational attempt which is clearly to enhance the student's perception of their ability to accomplish the subsequent task. The teacher is not telling the student what to do (e.g., an instructional prompt - behavior 7) but is clearly trying to build confidence (e.g., "you can do it," or "if you did it last time you can surely do it this way," etc.). This category may also be recorded when encouraging behaviors are conveyed to the class population as a whole or to small groups of students.

Positive feedback: The teacher makes a positive verbal statement or gesture following an individual's or group of students' skill or organizational behaviors that is clearly designed to increase or maintain such responses in the future. The statement or gesture must follow soon enough after the behavior that the student clearly associates it with the behavior commented upon. Feedback statements may easily be delineated from encouraging statements for encouragement occurs prior to the student behavior in question and feedback occurs after.

Negative feedback: The teacher makes a negative or critical verbal statement or gesture following an individual's or group of students' inappropriate skill or organizational behaviors which is clearly designed to decrease or eliminate such responses in the future. The statement or gesture must follow soon enough after the behavior that the student clearly associates it with the behavior commented upon.

Management: The teacher is engaged in carrying out a non-subject-matter organizational task (e.g., setting up equipment, taking roll, collecting papers, explaining station rotations, etc.). This category may be conducted in a verbal or gesturing manner.

Verbal instruction: The teacher is verbally describing to the students how to do a skill or is using a verbal prompt to direct a student or group engaged in attempting a skill or activity. The student task must be a subject matter activity in order to record verbal instruction.

Modeling: The teacher demonstrates to students how to do a subject matter task, or participates with students in a subject matter task or activity. If the teacher utilizes a student to demonstrate a subject matter task, this category may also be recorded for the duration of the student demonstration episode.

Physical guidance: The teacher physically guides an individual or group of students through a subject matter task or activity. Actual physical contact must be made and maintained with the student in question for this category to be recorded.

It should be noted here that while verbal instruction (7) could be occurring in concert with modeling (8) and/or physical guidance (9), the higher order behavior supersedes the lower for the purpose of data recording. In other words, if modeling (8) is occurring along with verbal instruction (7), the category of modeling (8) must be recorded. In similar fashion, if physical guidance (9) is occurring along with modeling (8), physical guidance (9) must be recorded.

Non-task verbal positive: The teacher talks to an individual or group of students about non-subject-matter and non-managerial tasks in a manner that is clearly designed to foster a positive interpersonal relationship between teacher and student. Commenting on a student's clothing or talking about what one student did over the weekend are examples of non-task verbal positive.

Teacher off-task: The teacher is clearly not paying attention to the instructional and/or organizational responsibilities regarding the class at hand. Making notes on what to do during football practice during the course of a physical education class, flirting with the passing office staff, or daydreaming against the gymnasium wall are clear examples of off task behavior.

Student Behaviors

Motor appropriate: The student is engaged in a subject matter motor activity in a successful manner (i.e., ALT-PE).

Motor inappropriate: The student is engaged in a subject matter oriented motor activity but the task is either too difficult for the individual's capabilities or the task is so easy that student practice is performed poorly or incorrectly, clearly not contributing to lesson goals.

Supportive: The student is engaged in assisting others to perform a subject matter motor activity (e.g., spotting in gymnastics, feeding balls to a hitter in a tennis lesson, throwing a volleyball to a partner who is practicing set up passing, clapping a rhythm for a group of students practicing a dance movement pattern, etc.).

Cognitive: The student is clearly and attentively listening to the teacher or a visual aide explaining an organizational or subject matter task (e.g., verbal description of a game, watching a modeling episode, viewing a filmstrip, participating in a discussion, etc.).

On-task: The student is appropriately engaged in carrying out an assigned non-subject-matter task which is designed to prepare for a learning and/or skill attempt (e.g., moving into squads, moving from the gymnasium to the playing field, reading prescription sheets at a drill station, etc.). This category may be equated with any student managerial or transitional tasks undertaken to attain a state of learning readiness.

Off-task: The student is either not engaged in an activity in which it is clear he/she should be engaged in, or is engaging in an activity other than the one clearly advocated by the teacher (e.g., behavior disruptions, misusing equipment, fighting, etc.).

Peer instruction: The student is clearly teaching either an individual or group of his/her peers regarding the subject matter activity at hand. This category includes student performance of any of the three teacher instructional behaviors (e.g., verbal instruction - 7, modeling - 8, or physical guidance -9).

Waiting time: The student has completed a task and is awaiting the next instructions or opportunity to respond. Waiting in line for a turn, waiting for the next teacher direction, waiting to get into a game from the sideline, waiting for the next activity to begin, are all examples of this category.

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