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Path Associations Between Preservice Physical Educators' Beliefs About Epistemology and Their Value and Self-Efficacy for Sport Education and Teaching Games for Understanding

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Abstract

Teachers' beliefs about epistemology – that is, their personal broad mental representations about the nature of reality, knowledge, and how people know and learn – have been associated with the many educational outcomes both in the classroom and in physical education. Little is known about whether these beliefs predict physical educators' value (i.e., interest, importance, like, and usefulness) and self-efficacy (i.e., confidence in performing) for using constructivist teaching models such as sport education and teaching games for understanding. As a result, this study examined path associations from beliefs about epistemology (epistemic worldviews and epistemological beliefs) to value and self-efficacy for sport education and TGfU in prospective physical educators. The sample consisted of 317 undergraduate students enrolled in a large (19,000 student) public university in south-central Canada. These participants completed a survey lasting approximately 10-12 minutes near the conclusion of one of their elective university classes in formal individual-dual games/sports (third year) or formal team games/sports (fourth year). Results revealed that students on average held more to a constructivist than a realist epistemic worldview, held relatively low unavailing epistemological beliefs for games (e.g., stable and simple knowledge that is learned quickly, and had high value and self-efficacy for sport education and teaching games for understanding. The path analyses revealed an excellent fit of the model to the data for these constructivist instructional models with each pathway significant for teaching games for understanding and three of the four for sport education. The results signal that prospective physical educators may be more susceptible to having less value and self-efficacy for using more constructivist instructional models if they believe games knowledge is relatively stable, objective, uncomplicated (simple), quickly learned facts derived more passively (rote learning) from mainly outer sources like expert teachers, coaches, and information resources. More efforts may be needed to uncover, explain, and account for underlying beliefs about epistemology prior to operationalizing constructivist instructional models such as sport education and teaching game for understanding.

Path Associations Between Preservice Physical Educators' Beliefs About Epistemology and Their Value and Self-Efficacy for Sport Education and Teaching Games for Understanding

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Abstract

Teachers' beliefs about epistemology – that is, their personal broad mental representations about the nature of reality, knowledge, and how people know and learn – have been associated with the many educational outcomes both in the classroom and in physical education. Little is known about whether these beliefs predict physical educators' value (i.e., interest, importance, like, and usefulness) and self-efficacy (i.e., confidence in performing) for using constructivist teaching models such as sport education and teaching games for understanding. As a result, this study examined path associations from beliefs about epistemology (epistemic worldviews and epistemological beliefs) to value and self-efficacy for sport education and TGfU in prospective physical educators. The sample consisted of 317 undergraduate students enrolled in a large (19,000 student) public university in south-central Canada. These participants completed a survey lasting approximately 10-12 minutes near the conclusion of one of their elective university classes in formal individual-dual games/sports (third year) or formal team games/sports (fourth year). Results revealed that students on average held more to a constructivist than a realist epistemic worldview, held relatively low unavailing epistemological beliefs for games (e.g., stable and simple knowledge that is learned quickly, and had high value and self-efficacy for sport education and teaching games for understanding. The path analyses revealed an excellent fit of the model to the data for these constructivist instructional models with each pathway significant for teaching games for understanding and three of the four for sport education. The results signal that prospective physical educators may be more susceptible to having less value and self-efficacy for using more constructivist instructional models if they believe games knowledge is relatively stable, objective, uncomplicated (simple), quickly learned facts derived more passively (rote learning) from mainly outer sources like expert teachers, coaches, and information resources. More efforts may be needed to uncover, explain, and account for underlying beliefs about epistemology prior to operationalizing constructivist instructional models such as sport education and teaching game for understanding.

Key words: motivation, epistemological beliefs, instructional models, confidence, interest

Introduction

Despite the many merits of knowledge in physical education, sports, and games (Hare & Graber, 2000; McPherson & Kernodle, 2003), these can be compromised when learners hold counterproductive beliefs about epistemology – defined by Grecic and Collins (2013) as “beliefs about knowing and learning that reflect views on what knowledge is, how it is gained, and the limits and criteria for determining knowledge” (p. 152). A review by Bendixen and Feucht (2010) reports that teachers' beliefs about epistemology have been associated with the motivation, epistemological beliefs, and academic achievement of their students along with several aspects of their instruction leading Soleimani (2018) to assert that “studying epistemological beliefs has been recognized to be the first step toward triggering changes into teacher education programs and...the teaching profession” (p. 48). Research in physical education indicates that practicing and prospective physical educators' values and beliefs about epistemology (e.g., Rovegno & Dolly, 2006; Zhu, Shen, & Chen, 2021) tend to predict aspects of their instructional practices; including their propensity to use instructional models such as direct

teaching, sport education, and teaching games for understanding (TGfU). Little is known about whether these beliefs predict physical educators' value (i.e., interest, importance, like, and usefulness) and self-efficacy (i.e., confidence in performing) for using such models. Grounded in cognitive mediation theory (Solmon, 2006) – particularly assertions of the important role of cognized beliefs on knowledge, achievement, and mental learning processes and through contextual factors such as instruction – this study examined path associations (Figure 1 and 2) from beliefs about epistemology (epistemic worldviews and epistemological beliefs) to value and self-efficacy for sport education and TGfU in prospective physical educators.

Beliefs About Epistemology

Epistemic worldviews.

The proposed path model in this study originates with two primary frameworks of beliefs about epistemology, namely, epistemic worldviews and epistemological beliefs. After conducting their own research and reviewing other research and educational and philosophical theory, Schraw and Olafson (2002) defined the first framework (epistemic worldviews) as personal broad mental representations about the nature of reality, knowledge, and how people know and learn. The three epistemic worldviews are realism and relativism as polar extremes with contextualism as a medium or hybrid perspective. In short, they vary according to the degree each emphasizes the subjectivity, universality, and certainty of knowledge along with internal-external and constructivist influence on knowledge acquisition. Research into these epistemic worldviews (e.g., Olafson & Shraw, 2010; Schraw & Olafson, 2002) have revealed links between them and teachers' views about reality, the curriculum, instruction (e.g., emphasis on critical thinking), assessment methods, and specifically between a realist perspective and more maladaptive epistemological beliefs (i.e., the source, simplicity, and stability of knowledge). Lodewyk (2009a, p. 909) explains the two polar epistemic worldview perspectives as:

Realists view knowledge as relatively real, objective (e.g., factual), and unchanging. They believe knowledge can be mastered by experts (e.g., authorities, textbooks) who then efficiently transmit it rather authoritatively through a pre-established curriculum to passive learners. These learners subsequently reconstruct the knowledge through systematic conscious practice. Finally, mainly norm-based assessments are used to ensure that students comprehend the critical content. At the opposite extreme, relativists espouse knowledge as highly subjective, evolving, and unknowable beyond the individual mind. Thus, each person constructs understanding that is as important as, yet unique from, the understanding of every other. On this basis, a teacher with a relativist worldview deemphasizes their own value-laden knowledge or expertise to facilitate rather than transmit learner-constructed knowledge by fostering creativity, autonomous thought, and more effective self-regulated learning skills. Peers are important as social models rather than as co-constructors of knowledge and assessments are mainly criterion-based or self-referenced so that an individual's needs are attained.

In a study of practicing physical education teachers, Lodewyk (2011) found that although most teachers preferred a relativist worldview, autonomous teaching practices were positively associated a contextualist worldview and negatively linked to a realist perspective and a preference for direct teaching. The study also reported that a contextualist worldview was associated with more adaptive epistemological beliefs in the simple-integration and stable-expertise of knowledge. A study in prospective physical educators (Lodewyk, 2015) revealed that higher realist beliefs and lower contextualist beliefs were associated with those who

preferred direct teaching over more indirect methods like TGfU and sport education. Finally, Lodewyk (2009a) reported that fondness for using TGfU was lower in those with a realist epistemic worldview and higher in those with a relativist worldview.

Epistemological beliefs.

The second of the two belief about epistemology frameworks to be investigated in this study is epistemological beliefs. These beliefs are conceptualized along the following four dimensions: convictions about the speed of learning along with the simplicity, stability (i.e., certainty), and source of knowledge and knowing (Bendixen & Feucht, 2010; Lodewyk, 2009b, 2015). To illustrate these beliefs to games, these can take the form of, for example, espousing games knowledge more maladaptively as a set of relatively quickly learned, unchanging (stable or certain), and isolated and uncomplicated facts (simple) that emanate predominately from experts (source). Conversely, learners can view games knowledge more adaptively as generally malleable or ambiguous (unstable) concepts that are complex and integrated with other disciplines (e.g., science, math, and psychology), and originate over time and with effort through experimentation, self-construction and regulation, and reasoned justification using multiple credible sources (Lodewyk, 2015). Some of the many positive academic outcomes associated with more adaptive epistemological beliefs include persistence, depth of processing and reflection, grade, use of helpful study strategies, conceptual change, self-efficacy, and an intrinsic goal orientation (for a review, see Bendixen & Feucht, 2010).

Quantitative research on epistemological beliefs in physical education has generally used the *Beliefs about Epistemology in Physical Education Questionnaire* (Lodewyk, 2009b; Lodewyk & Sullivan, 2010) with some minor modifications for teachers (Lodewyk, 2011) and other disciplines within physical education such as fitness (Lodewyk & Gao, 2013) or games (Lodewyk, 2009a; 2015). The measure that has been applied to games and used with prospective physical educators (Lodewyk, 2015) has 11 items collectively assessing maladaptive epistemological beliefs in the simplicity, stability, and speed of learning knowledge for games. The research with high school (Lodewyk, 2009b; Lodewyk & Gao, 2013) and university (Lodewyk & Sullivan, 2010) physical education students linked maladaptive epistemological beliefs to lower grades, lower beliefs in the need for cognition, and lower fitness and intrinsic and extrinsic goal orientation, value, perceived autonomy support, and effort regulation for fitness during physical education. The research studies with practicing and prospective physical educators reported significant links between maladaptive epistemological beliefs and higher entity and lower incremental ability conceptions (Lodewyk, 2011), higher realist (Lodewyk, 2009a; 2015) and lower relativist epistemic worldviews (Lodewyk, 2009a), a lower need for cognition (Lodewyk, 2009a; 2015), and less of a desire to use TGfU when teaching physical education (Lodewyk, 2009a).

Value and Self-Efficacy in Teachers

The value (i.e., interest, importance, like, and usefulness) and self-efficacy (i.e., confidence to perform what is necessary to achieve a specific outcome) one has for task can profoundly influence their decisions, engagement, and success with it (Duncan & McKeachie, 2005). The importance of self-efficacy on teaching motivation and performance is compelling through, for example, its links to teacher planning and organization, being willing and having the self-efficacy to change instructional practices, and increased student achievement (Kern & Graber, 2017; Kuhn, Carson, Beighle, & Castelli, 2021). In physical education, teacher self-efficacy has also been associated with a heightened willingness to implement new curricula (Martin, McCaughtry, Hodges-Kulinna, & Cothran, 2008) and with students' motivation,

atmosphere, and satisfaction for learning (Pan, 2014). Further, Kern and Graber's (2017) study of over 2000 physical education teachers reported that likelihood of making future change was positively predicted by self-efficacy to change and negatively by value for (i.e., being satisfied with) the existing physical education program.

Sport Education and Teaching Games for Understanding

Although direct (instructor-centered) teaching is the most common mode of instruction in both practicing and pre-service PE teachers (Butler, 2005; Metzler, 2011; Oslin & Mitchell, 2006), experts have called for practitioners to increase their use of indirect (more constructivist) models of instruction such as sport education and TGfU wherein the instructor is more of a facilitator than sole source and transmitter of learning and positive affect by purposely situating their instruction for each student and context while better engaging them to personally and collectively construct and regulate their learning (Oslin & Mitchell, 2006; Rovegno & Dolly, 2006). TGfU is designed to do this through, for example, having students design, sample, problem-solve, and modify realistic game-like activities to increase engagement, learning, and transferability to other forms of games. Sport education helps students to construct their learning by building an inclusive communal sporting culture wherein all students feel a sense of affiliation with others including their team through, for example, participating actively, serving a variety of roles, and exhibiting positive character and citizenship (Kinchin, 2006). There is substantial research evidence for the benefits of effective implementation of these models on knowledge, motivation, performance, physical activity, affect, problem-solving, and social and life skills (Byrne & Spittle, 2009; Curtner-Smith & Stran, 2009; Oslin & Mitchell, 2006).

Objectives

The need is clear for more research on relations between beliefs about epistemology and physical educators' instructional beliefs and practices, so this study investigated a proposed path from a realist epistemic worldview, through maladaptive epistemological beliefs, and to value (interest, importance, liking, and usefulness) and self-efficacy for using the instructional models of sport education and TGfU. The three specific objectives for the study were to: (1) ensure that the factor structure of epistemological beliefs was consistent as previously reported in games by Lodewyk (2015); assess the means for, and correlations between, epistemic worldviews, epistemological beliefs, and value and self-efficacy for sport education and TGfU; and (3) determine the fit of the data to the proposed path model for sport education and TGfU.

Method

Participants and Procedures

A total of 317 undergraduate students enrolled in a large (19,000 student) public university in south-central Canada completed a survey lasting approximately 10-12 minutes during yet near the conclusion of one of their elective university classes in formal individual-dual games/sports (third year) or formal team games/sports (fourth year). Following data screening, four outlier cases were deleted due to excessive Mahalanobis distance values ($\alpha^2 = .001$; Tabachnick & Fidell, 2006) and four cases for having incomplete surveys. Therefore, the final sample consisted of 309 junior (3rd year) or senior (4th year) students ($n = 172$ females and 137 males) majoring in physical education ($n = 243$; 78.6%), kinesiology ($n = 48$; 15.5%), or other majors ($n = 18$; 5.8%) such as sport management or recreation and leisure. Consent was received from the university research ethics board and from each study participant who were informed there was no right or wrong answer to survey items and that their responses would be anonymous and confidential.

The survey (requiring approximately 10-12 minutes to complete) was administered by the course professor and lead author of this study during regular class time and across six semesters near the conclusion of two undergraduate games/sports courses enrolled by mainly physical education (teaching stream) or kinesiology (coaching stream) majors. Each course taught students similarities and differences in skills, rules, and strategies across various many formal team and/or individual/dual games (sports) through a two hour/week lab component held at the appropriate venue (e.g., gymnasium, swimming pool, softball diamond, squash court, or outside playing field) and a 50 minute/week lecture component held in a classroom. Students were taught the theory and rationale for the direct, sport education, and TGfU instructional models for approximately 30 minutes of lecture for each model and through two assigned readings. Each model was then demonstrated by qualified lab instructors with relevant expertise on each model through a 60-minute physically active lesson during lab. After these three introductory lectures and model labs, small groups of students prepared and taught their peers a 75-minute lesson during lab using one of the models after receiving and applying feedback about their proposed lesson from their lab instructor. As part of their weekly lab assignments, students also provided written reflections on each lesson. Therefore, each student collectively participated in at least four lessons using each of the three instructional models. The students' final grades were weighted on their weekly lab assignments (35%), small group ($n = 2-3$) teaching presentation of a sample instructional lesson using either direct teaching, sport education, or TGfU (25%), and two written exams (40%).

Measures

Realist Epistemic Worldview.

Realist and less-realist (more contextualist or relativistic) epistemic worldviews have been previously measured using validated vignette assessments (e.g., Olafson & Schraw, 2010; Schraw & Olafson, 2002) wherein students are allotted 100 points to distribute across three one-paragraph vignettes each reflecting either a more realist, contextualist, or relativist epistemic worldviews described earlier based on how much they agreed with each. In this study, the same vignette as Olafson and Schraw, 2010) was used for a realist epistemic worldview was used and a blend of the contextualist and relativist vignette was used to represent a less realist (more relativist or constructivist) epistemic worldview. For example, if a participant agreed strongly with the realist than relativist vignette, they might provide a rating of 75 for realist and 25 for relativist. These two vignettes have been used previously to assess epistemic worldviews in physical education (Lodewyk, 2009a; 2009b) although only the realist worldview was used in this study.

Epistemological Beliefs for Games.

The 11-item *Beliefs about Epistemology in Games Questionnaire* used previously by Lodewyk (2015) was used to assess participants' level of "sophistication" in epistemological beliefs for games (EBG). The scale is also conceptually similar with other quantitatively assessed EBG (Lodewyk, 2009a), physical education (Lodewyk, 2009b; Lodewyk & Sullivan, 2010), or in fitness within physical education (Lodewyk & Gao, 2013). The items used a five-point Likert response scale ranging from "strongly disagree" (1) to "strongly agree" (5) and are listed in Table 1. The alpha reliability coefficient for EBG in this study was .74. Those scoring higher on the scale are deemed to have relatively less advantageous (i.e., unsophisticated) beliefs in the simplicity, stability, and speed of learning games knowledge.

Self-Efficacy for Sport Education and TGfU.

After light modification of the items for application to sport education and TGfU, three of the four-item self-efficacy for performance scale in the *Motivated Strategies for Learning Questionnaire* (Pintrich et al., 1991; for a review, see Duncan & McKeachie, 2005) and used to assess self-efficacy for performing sport education (3 items) and TGfU (3 items). The items used a five-point Likert response scale ranging from “strongly disagree” (1) to “strongly agree” (5). The items applied to TGfU were: (1) “When instructing games, I believe I can very effectively model TGfU”; (2) “When I instruct games, I’m confident I can do an excellent job using TGfU”; and, (3) “When I instruct games, I expect to do well if I use TGfU.” The same items were used for sport education by replacing TGfU with sport education. This scale has been used previously in physical education research (Lodewyk, & Gao, 2013). The alpha reliability coefficients were satisfactory for self-efficacy for sport education (.87) and for TGfU (.90).

Value for Sport Education and TGfU.

To measure value for sport education and TGfU, four of the most relevant items (one each for interest, importance, liking, and usefulness) were used from the *Motivated Strategies for Learning Questionnaire’s* (Pintrich et al., 1991) six-item task value scale.

Table 1***Exploratory Factor Analysis of the Epistemological Beliefs for Games Scale Items***

Factor Items	Loading
1. All experts in games understand games in the same way.	.68
2. If I am ever going to understand something in games, it will make sense the first time I hear it.	.62
3. In games, most challenges have only one right answer.	.60
4. It is a waste of time to work on challenges in games that have no possibility of coming out with the correct performance or answer.	.59
5. In games, if I cannot understand something quickly it usually means I will never understand it.	.58
6. The concepts to be learned in games are unchanging.	.58
7. Most things worth knowing in games are easy to understand.	.50
8. To learn information the best in games, I should memorize the facts.	.47
9. A challenge in games can be approached in several different ways.	.44
10. It is important for students to connect ideas learned in games to what they already know.	.36
11. There are connections between the material in games and in other activities like dance, gymnastics, and fitness.	.36
Variance Explained (%):	28.51

Note: N = 309; Principal Components Factor Analysis (One-Factor Extraction); Items 10 and 11 are reverse coded.

This scale has been used previously in physical education research (e.g., Lodewyk & Gao, 2013). The items for TGfU were: (1) “Being able to perform and understand the TGfU model will be very useful to me”; (2) I am very interested in TGfU as a method of instructing

games”; (3) “Performing and understanding the TGfU model is very important to me”; and, (4) “I like participating in and learning about TGfU for instructing games.” The same 5-point Likert-scale was used as in the earlier measures and the same item stems were used for sport education. Alpha reliability for value for sport education was .90, and it was .94 for value for TGfU.

Data Analysis

The Statistical Package for the Social Sciences (SPSS; version 26.0) was used for screening for normality and computing alpha reliability coefficients (α), descriptive statistics, and bivariate (Pearson) correlations. Two path analyses were performed using AMOS (Version 26) and fitted using the robust maximum likelihood estimation for study variables. The first originated from a realist epistemic worldview through epistemological beliefs for games to value and then self efficacy for sport education. The second was identical except inserting value and self-efficacy for TGfU.

Results

Data screening revealed that the scales and items were normally distributed (Tabachnick & Fidell, 2006). To ensure that the factor structure for EBG was consistent with previous use of the scale (Lodewyk, 2015), a principal component exploratory factor analysis with varimax rotation extracting one factor with loadings $> .35$ (Tabachnick & Fidell, 2006) was performed on the 11 survey items. Each item loaded onto the factor (see Table 1) that explained 27.86% of the variance.

Table 2

Descriptive Statistics and Correlations

Scales	REW	EBG	VspEd	SESpEd	VTGfU	SETGfU
Mean	35.61	2.13	3.90	4.09	3.95	4.13
SD	16.41	.42	.74	.63	.85	.70
A	-	.74	.90	.87	.94	.90
REW	-					
EBG	.22**	-				
VSpEd	-.14*	-.04	-			
SESpEd	-.07	-.09	.60**	-		
VTGfU	-.24**	-.20**	.07	-.04	-	
SETGfU	-.21**	-.23**	.03	.17**	.68**	-

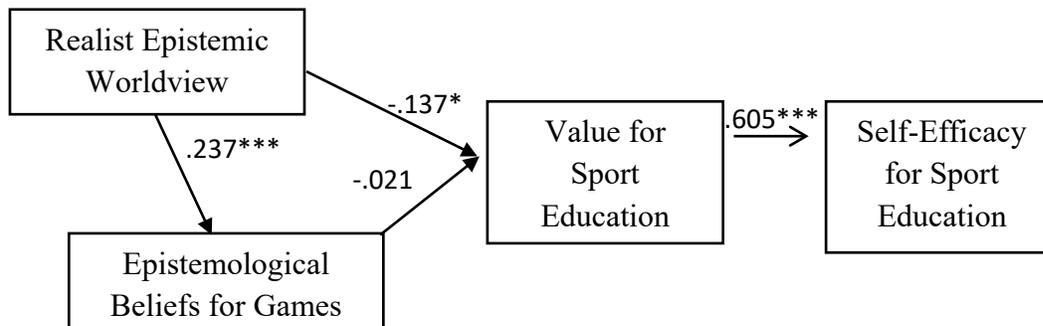
Note. N = 309; SD = Standard Deviation; REW = Realist Epistemic Worldview; EBG = Epistemological beliefs for Games; VspEd = Value for Sport Education; SESPd = Self-Efficacy for Sport Education; VTGfU = Value for Teaching Games for Understanding; SETGfU = Self-Efficacy for Teaching Games for Understanding. * $p < .05$; ** $p < .01$.

Therefore, EBG in this study appear to be similar conceptually to those studies previously by Lodewyk (2015) who described the scale as “a blended belief that knowledge for games is relatively unchanging and factual (can be memorized); quickly and universally approached, understood, and resolved; and, not integrally aligned with prior knowledge or with other movement disciplines such as dance, gymnastics or fitness” (p. 689).

Descriptive statistics, alpha reliability coefficients, and bivariate (Pearson) correlations for the constructs are provided in Table 2. Scale alpha reliability coefficients were satisfactory ($\alpha > .73$).

Figure 1

Path analysis with Sport Education.

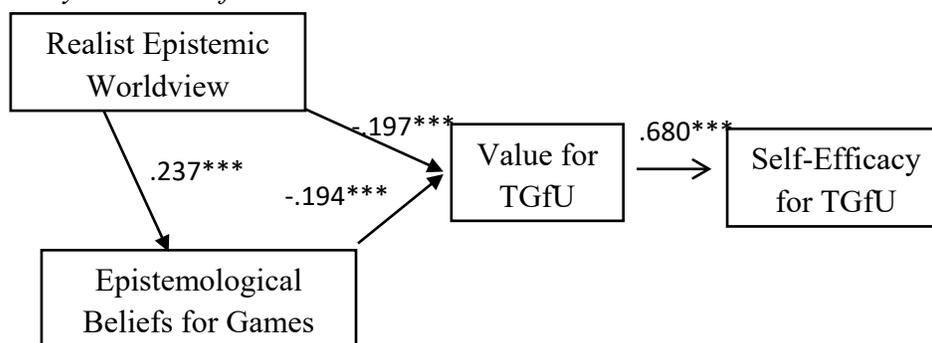


Note. Standardized values are given. Goodness of fit indices: $\chi^2_{(2)} = 2.13$, $p = .346$; CFI = .999; SRMR = .020; AGFI = .983; RMSEA = .014; * $p < .05$; ** $p < .01$; *** $p < .001$.

Analysis of the descriptive statistics revealed that students on average held more to a constructivist than a realist epistemic worldview ($M = 36.61/100$), held relatively low unavailing EBG (e.g., stable and simple knowledge that is learned quickly) ($M = 2.13$ out of 5), and had high value and self-efficacy for sport education and TGfU ($> 3.90/5$). Bivariate correlations revealed that those who more strongly valued sport education tended to have a higher self-efficacy for using sport education ($r = .60$) when teaching or coaching games. The same relationship was true when applied to TGfU ($r = .68$). Other notable significant positive relationships were between a realist epistemic worldview and EBG ($r = .22$). Finally, those with a higher realist epistemic worldview were less likely to value sport education ($r = -.14$) and TGfU ($r = -.24$) and had lower self efficacy for TGfU ($r = -.21$); whereas those holding relatively unavailing (unsophisticated) EBG were less likely to value ($r = -.20$) and be self-efficacious ($r = -.23$) for teaching games using TGfU.

Figure 2

Path analysis with TGfU.



Note. Standardized values are given. Goodness of fit indices: $\chi^2_{(2)} = 7.38$, $p = .025$; CFI = .978; SRMR = .037; AGFI = .942; RMSEA = .093; *** $p < .001$.

For interpreting the goodness of fit of the path model (see Figures 1 and 2) to the data in this study, Hu and Bentler's (1999) proposed values for excellent fit were used; namely, .95 and

above on the adjusted goodness of fit (AGFI) and comparative fit index (CFI), .08 or less for the standardized root-mean-square residual (SRMR), and .10 or less for the root-mean-square error of approximation (RMSEA). These fit statistics in each of the path analyses revealed an excellent fit of the model to the data for both sport education ($\chi^2 (2) = 2.13, p = .346$; CFI = .999; AGFI = .983; SRMR = .020; RMSEA = .014; see Figure 1) and TGfU ($\chi^2 (2) = 7.38, p = .025$; CFI = .978; AGFI = .942; SRMR = .037; RMSEA = .093; see Figure 2). Three of the four pathways were significant for sport education. These were from a realist epistemic worldview to EBG ($\beta = .237$; $p < .001$) and value for sport education ($\beta = -.137$; $p = .018$); and, from value for sport education to self efficacy for sport education ($\beta = .61$; $p < .001$). Each of the pathways for TGfU was significant ($p < .001$); namely, from a realist epistemic worldview to EBG ($\beta = .237$) and value for TGfU ($\beta = -.197$); from EBG to value for TGfU ($\beta = -.194$), and from value for TGfU to self efficacy for TGfU ($\beta = .680$).

Discussion

The objectives for this research study were to: (1) ensure that the factor structure of epistemological beliefs was consistent as previously reported in games by Lodewyk (2015); assess the means for, and correlations between, epistemic worldviews, epistemological beliefs, and value and self-efficacy for sport education and TGfU; and (3) determine the fit of the data to the proposed path model for sport education and TGfU. Results revealed the extraction of one epistemological belief factor that was consistent previous research in games (Lodewyk 2009a, 2015). The sample had higher relativist than realist epistemic convictions, relatively adaptive epistemological beliefs about games, and a significantly positive relationship between a realist epistemic worldview and more maladaptive EBG. These findings have been reported previously in prospective teachers in the classroom (e.g., Schraw & Olafson, 2002; Olafson & Schraw, 2010), physical education (Lodewyk, 2011), and games (Lodewyk, 2009a, 2015). Associations between value and self efficacy in this study has been reported frequently (e.g., Duncan & McKeachie, 2005; Solmon, 2006), however, this relationship within and between sport education and TGfU is noteworthy. It signals that those who believe that sport education is interesting, useful, important, enjoyable to use when teaching games, share that conviction for TGfU (and vice versa); and, have a higher self-efficacy for using each model as they instruct games. This supports aspects of other research studies (e.g., Kern & Graber, 2017) associating physical educators' decisions to change by, for example, being open to implement new instructional models, with how strongly they anticipate success and value the change that is needed.

Perhaps the primary contribution of the study was the excellent fit of the data to the path model for both sport education and TGfU along with the finding that only one predictive pathway (epistemological beliefs about games predicting value for sport education) was not statistically significant. These results, along with the relatively high value and self-efficacy for both sport education and TGfU, may be indicative of the priority that the participants in this study place on student autonomy and collaborative problem-solving; along with their own preference and confidence for implementing more constructivist instructional models. It adds to the limited evidence signaling positive associations between a preference for constructivist teaching, adaptive epistemological beliefs, and a more contextualist-relativistic worldview (Lodewyk, 2009a, 2011, 2015; Schraw & Olafson, 2010). In other words, prospective physical educators may be more susceptible to having less value and self-efficacy for using more constructivist instructional models like sport education and TGfU if they believe games knowledge is relatively stable, objective, uncomplicated (simple), quickly learned facts derived

more passively (rote learning) from mainly outer sources like expert teachers, coaches, and information resources.

Previous physical education research has reported on some limitations of teachers' maladaptive beliefs about epistemology on, for example, their willingness to teach less directly (i.e., using less teacher-centered methods) and on their students' beliefs and achievement (Butler, 2005; Rovegno & Dolly, 2006). This is because more constructivist instructional models like sport education and TGfU are theoretically framed in a knowledge base that is complicated, interconnected with other disciplines and domains, situated in the context (so therefore malleable), and requiring of time, autonomy-support, collaboration with others, and perseverance to learn (Rovegno & Dolly, 2006). As a result, they emphasize the holistic needs of each student – an approach linked to higher achievement (Grecic & Collins, 2013) – through, for example, situating content within the setting and across domains, stimulating rich opportunities for reflection, discussion, problem-solving, and abstract reasoning wherein there is more than one factually correct answer (Lodewyk, 2015). The findings of this study signal that teachers' beliefs about epistemology may restrict their value and self-efficacy for instructing in this way.

A primary implication of this study and others (e.g., Bendixen & Feucht, 2010; Butler, 2005) is to improve physical education teacher candidates' awareness about epistemic worldviews and epistemological beliefs along with its potential role in their use of, value for, and self-efficacy when using sport education and TGfU. Based on a study of belief change in physical education teacher candidates after experiencing an alternative pedagogy in the form of a TGfU-like cooperative learning approach games unit, Moy et al. (2016, p. 387) reported increased receptiveness to the alternative pedagogy and recommended that “to mediate receptiveness, it is important that the learning theory underpinning the alternative approach is operationalised in a research-informed pedagogical learning design that facilitates students' perceptions of the effectiveness of the approach through experiencing and or observing it working.” Kern and Graber (2017, p. 11) add that if teachers “are dissatisfied with their current programs while lacking the confidence to make change, then it might be more appropriate to train teachers to utilize new teaching techniques rather than make efforts to influence their teaching philosophies.”

Future research should investigate this and other path models using mixed-methods and these and other constructivist-oriented instructional models such as cooperative learning along with direct teaching to enable more comparisons by model. For example, Lodewyk (2015) reported that preservice teachers with higher realist beliefs and lower contextualist beliefs were more likely in those who preferred direct teaching than indirect methods like TGfU and sport education. Meanwhile, Cohen and Zach (2013) found that preservice teaching efficacy was higher after a physical education unit taught directly compared to one taught using the cooperative learning model. They concluded that “teachers must internalize the set of values proclaimed as part of this educational approach before they attempt to impart it to their classes” (p. 385). They caution that doing so quickly, with inadequate guidance and support, and before teachers feel comfortable teaching directly, could induce feelings of insecurity that further compromise their self-efficacy to implement the cooperative learning model. A recommendation was that “physical education teacher education programs focus on no more than two or three instructional models during the three-year program, and that they be thoroughly practiced until they are mastered” (p. 377). The findings of this study should contribute added understanding about the potential role of epistemological beliefs and worldviews on prospective physical

educator's value and self-efficacy for using more constructivist instructional models such as sport education and TGfU.

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