


PEDAGOGY

Changes in Physical Education Teachers' Beliefs Regarding Motivational Strategies: A Quasi-Experimental Study

*Stéphanie Girard, Audrey-Anne de Guise,
Anne-Marie Hogue, Jean-François Desbiens*

Abstract

Physical education teachers use motivational strategies that can (positively or negatively) affect their students' level of motivation and engagement. Indeed, according to their experiences and beliefs, some teachers may focus on strategies that thwart, rather than support, students' psychological needs (autonomy, competence, and relatedness). Effective professional development represents an excellent opportunity to help teachers use research-supported motivational strategies. Therefore, this study aimed to discover if attendance at a 2-day training course could positively affect PE teachers' beliefs regarding empowering motivational strategies. Specifically, 11 PE teachers (experimental group = 6 [attending the training]; control group = 5 [no training]) from primary school (n = 6) and secondary school (n = 5) expressed their beliefs (effectiveness, feasibility, and normality) regarding 31 empowering motivational strategies proposed during training at the beginning (October) and the end (April) of the school year. Results

Stéphanie Girard , Department of Physical Activity Sciences, Université du Québec à Trois-Rivières. Audrey-Anne de Guise, Department of Education, Université du Québec à Trois-Rivières. Anne-Marie Hogue, Faculty of Education, Université de Sherbrooke. Jean-François Desbiens, Faculty of Physical Activity Sciences, Université de Sherbrooke. Please send author correspondence to stephanie.girard3@uqtr.ca

of the Wilcoxon signed-rank test for related samples indicated no significant differences for the belief regarding effectiveness in either group. However, some positive significant changes ($p \leq .05$) occurred in the experimental group for two motivational strategies supporting students' need for autonomy and one supporting their need for competence. Given the small sample, positive trends ($p \leq .10$) are also considered results of interest. In conclusion, the training appears likely to impact teachers' beliefs. However, future professional development should provide additional feedback and follow-up time with teachers during experimentation with students to allow teachers to refine their understanding and use of the motivational strategies proposed.

Regular practice of physical activity is essential for children's development. In addition to improving their physical condition and self-confidence, it can help reduce symptoms of depression and anxiety (Biddle et al., 2019). These beneficial effects are all the more important during the COVID-19 pandemic, when sedentary behaviors have increased and physical activity has decreased, resulting in potentially significant damage to the psychological and physical health of children and adolescents (Dunton et al., 2020). Although schools are already considered important for promoting physical activity (Alvarez-Bueno et al., 2017), Shahidi et al. (2020) emphasizes their importance when it comes to finding more ways to increase opportunities for physical activity following the pandemic. However, students, more specifically teenagers, are not highly motivated to participate in physical education (PE; Mercier et al., 2017). Even if several factors may impact students' reduced motivation toward PE and physical activity in general as they get older (jobs, loss of enjoyment, or discovery of new interests; Comité scientifique de Kino-Québec, 2012), the motivational climate their PE teachers establish affects their motivation as well (Sarrazin et al., 2006). Indeed, despite the importance of PE classes relative to students' adoption of an active lifestyle (Alvarez-Bueno et al., 2017; Girard et al., 2019; Martins et al., 2015; Rachele et al., 2016), PE teachers also use motivational strategies that can positively or negatively affect their students' level of engagement (Rocamora et al., 2019; Van den Berghe et al., 2016).

In 2013, Duda combined two well-known motivational theories to refine the conceptualization of an empowering, or disempowering, motivational climate: self-determination theory (SDT; Deci & Ryan, 2000) and achievement goal theory (AGT; Ames & Archer, 1988). According to the SDT framework (Deci & Ryan, 2000), individuals tend to engage in tasks or activities that support their basic psychological needs (autonomy, competence, and relatedness). To support the need for autonomy, they need to assign meaning to a task and commit to it of their own will. To support the need for competence, they need to learn in a structured environment that provides effective learning opportunities and increases their confidence in their chances of success. To support the need for relatedness, they must feel psychologically and physically safe among others so as to develop positive, profound, and meaningful relationships.

According to AGT, individuals tend to adopt achievement goals that match their perception of the motivational climate (Harwood et al., 2015). Perception of a mastery climate encourages the adoption of mastery goals, and perception of a performance climate encourages the adoption of performance-approach and performance-avoidance goals (Blais et al., 2020). When pursuing mastery goals, individuals engage in a task while seeking to progress and improve on the basis of their own ability. When pursuing performance goals, they evaluate their competence by comparing themselves to others. If they feel they compare well with their classmates, they may engage in a task while looking to outperform others (performance-approach goals). If they view themselves as less competent than their peers, however, they may adopt avoidance strategies to protect their self-esteem, an approach that discourages motivation and engagement (Elliot & Church, 1997).

By merging the AGT and STD conceptualizations of motivational climate, Duda (2013) suggests that teachers help support students' needs for autonomy, competence, (structure-SDT and mastery-AGT) and relatedness by creating an empowering motivational climate. Table 1 provides a list of effective strategies for supporting students' motivation in PE (adapted from Girard et al., 2021).

Table 1*Strategies to Create an Empowering Motivational Climate*

Need	Strategies
Autonomy support	<ol style="list-style-type: none">1. Acknowledge students' interests, feelings, and perspective.2. Provide rationale for requests and constraints.3. Explain tasks' and exercises' importance, utility, and significance.4. Provide meaningful choices.5. Give students the opportunity to practice independently and solve problems on their own, without interfering.6. Encourage initiative-taking.7. Provide opportunities to involve students in the course review.
Competence support (structure)	<ol style="list-style-type: none">1. Give an overview of the content and structure of the lesson.2. Give clear (verbal) instructions.3. Offer expectations for learning.4. Verify students' follow-up on (verbal) instructions.5. Offer help and give tips and advice during activities.
Competence support (mastery)	<ol style="list-style-type: none">1. Demonstrate task and/or use students as positive "role models."2. Provide tasks adapted to the multiple abilities of the students.3. Provide variation between or within exercises.4. Emphasize task-focused positive competence feedback.5. Emphasize/recognize effort and/or improvement.6. Use cooperative learning.7. Apply differentiation.8. Emphasize effort and engagement in the learning process rather than student performance.

Table 1 (cont.)

Need	Strategies
Relatedness support	<ol style="list-style-type: none">1. Ensure all students are included and respected in the group.2. Express enthusiasm and passion.3. Put effort and energy into facilitating and conducting the lesson.4. Adopt a warm communication style.5. Engage in noninstructional conversation with students.6. Pay attention to what students are saying.7. Show care and concern for students.8. Address pupils by their first name when the opportunity occurs.9. Be empathic.10. Be physically and psychologically close to students.11. Show unconditional regard towards all students.

Despite empirical evidence supporting the implementation of empowering motivational strategies (Blais et al., 2020; De Meester et al., 2020; Haerens, Krijgsman, et al., 2018; Haerens, Vansteenkiste, et al., 2018; Van den Berghe et al., 2016; Girard & Lemoyne, 2018), not all PE teachers are inclined to use them. The fact is, in keeping with their experiences and beliefs (Pajares, 1992; Reeve et al., 2014), some teachers may focus on strategies that thwart needs instead of support them. For example, although extrinsic rewards or controlling strategies may thwart the need for autonomy (Murayama et al., 2017), many teachers favor these practices because they believe students are motivated by them, which is not quite the case (Reeve, 2009). Furthermore, in PE, the use of competition to support students' motivation is a popular practice (Bernstein et al., 2013). By emphasising superior ability, however, teachers risk thwarting some students' need for competence (Reeve, 2009), thereby discouraging their motivation. Finally, a cold or distant manner or limited opportunities for interactions can thwart the need for relatedness (Skinner & Belmont, 1993). Indeed, teachers may underestimate the importance of their relationship with their students.

Given that individuals tend to adopt strategies they believe to be effective, easy to implement, and favored by colleagues (Reeve & Cheon, 2016), addressing teachers' beliefs about how to motivate students represents an essential step in convincing them to adopt effective motivational strategies. Indeed, according to Ajzen (1991), individuals tend to adopt behaviors they feel will have a positive outcome, are easy to implement, and fit within their environment's social norms. Toward this end, ongoing professional development looks to be an excellent opportunity to reach teachers (Aelterman et al., 2013; Girard et al., 2021) and encourage them to implement changes in practice. In fact, international studies reveal that teachers' professional development is a superior way to help teachers improve the quality of their teaching practices (Richard, 2020). Encouraging participation in professional development recognizes the key role of the teacher effect in the quality of students' learning (Richard, 2020) and in their success (Hattie, 2009, 2012). Put differently, investing time and energy on teachers' professional development allows for longer term improvement of the education system and contributes, at the same time, to students' academic success (Desimone 2009; Dornstauder & Chorney, 2019).

In this study, professional development formed part of the teachers' ongoing education and enabled them to develop two specific professional competencies: "to engage in ongoing professional development and in the life of the profession" and "to support the enjoyment of learning" (Ministère de l'Éducation, 2020). Darling-Hammond et al. (2017) maintain that, to be effective, professional development must be content focused, incorporate active learning, encourage collaboration, use models and modeling of effective practice, provide coaching and expert support, offer opportunities for feedback and reflection, and be of sustained duration.

In line with the above, this study aimed to discover if attendance at a 2-day training course could positively affect PE teachers' beliefs relative to empowering motivational strategies. We hypothesized that subsequent to the course, PE teachers would hold more positive beliefs (effectiveness, feasibility, and normality) about empowering motivational strategies than PE teachers who did not participate, as was the case in studies on the same subject (Aelterman et al., 2014; Reeve et al., 2014).

Method

After ethical approval from the university, all PE teachers (41 primary and 7 secondary school) from a service center in Montreal (Canada) received an invitation to participate in a 2-day training course (over 3 days) offered by the educational consultant and the study's principal investigator, Stéphanie Girard. Among them, seven primary school teachers and five secondary school teachers expressed their interest in taking part in the project. Some, however, were interested only if they could be in the control group, without attendance at training. In addition, one primary teacher (in the control group) went on sick leave prior to the first measurement time and was excluded from the study. Hence, the sampling was mixed and nonprobabilistic (Fortin & Gagnon, 2016), which explains the study's quasi-experimental design. In the end, the experimental group consisted of six teachers ($M_{\text{age}} = 36.77$ [$SD = 11.22$]; age range: 27–52; experience in teaching: 2–19 years; seniority in their school: 0–16 years) and the control group consisted of five teachers ($M_{\text{age}} = 41.37$ [$SD = 6.61$]; age range: 33–50; experience in teaching: 9–24 years; seniority in their school: 3–24 years).

Training took place over 3 days: one day in November 2018, a half day in December 2018, and another half-day in March 2019. The purpose was to familiarize participants with the strategies supporting students' motivation in PE. More specifically, the objective was to lead them to understand what supports students' motivation in PE class, question their own theory-based practices, and experiment some motivational strategies with their students (for more details about the development of the training, see Girard et al., 2021). As Table 2 shows, we used various training modalities that respected the seven characteristics Darling-Hammond et al. (2017) outlined for effective professional development.

PE teachers from both groups (experimental and control) completed the same questionnaire at two measurement points: once prior to the first day of training in October 2018 and once after conclusion of training in April 2019.

Table 2*Adherence to Recommendations for Effective Professional Development*

Characteristics of effective professional development	Examples of application during training
1. Content focus	Provision of theoretical foundations and empirical evidence; theory presentation with practical examples
2. Active learning	Video analysis; identification of a group to experiment with; identifying signs of student engagement; time to plan experimentation; experimentation anchored in teachers' daily practice
3. Collaboration	Provide interaction and collaboration opportunities between participants, mixing primary and secondary school teachers; exchanges and discussions, teamwork
4. Provision of models	Delivered in a need-supportive way (practice what you preach!; see Aelterman et al., 2016)
5. Coaching and expert support	Educational consultant and professors; using multiple resources such as a grid to analyze their use of empowering motivational strategies and an instructional communication tool
6. Feedback and reflection	Individual and collective; observation during a class and individual feedback
7. Sustained duration	Two days spread over 3 days during an entire school year (October 2018, December 2018, and March 2019), with one observation with feedback from the educational consultant or professors

Teachers' Beliefs

The items used in measurement of PE teachers' beliefs regarding the 31 motivational strategies in Table 1 were inspired by those used in studies on the subject (Aelterman et al., 2014; Aelterman et al.,

2016; Reeve et al., 2014). Because of the nature of the scale (one judgment per observation), measures of internal consistency cannot be provided, as was the case in these studies. Specifically, for measurement of the effectiveness of the 31 motivational strategies, teachers were asked, “On a scale from 1 (*totally disagree*) to 5 (*totally agree*), how effective do you find this strategy?” for measurement of their beliefs regarding the feasibility of each strategy, they were asked, “On a scale from 1 (*totally impossible*) to 5 (*totally possible*), how feasible do you find this strategy?” For measurement of the normal belief regarding motivational strategies, they were asked, “On a scale from 1 (*not at all representative*) to 5 (*very representative*), to what extent does this strategy represent the norm in your school/department?”

We used the Wilcoxon signed-rank test for related samples (Howell, 2008; Siegel & Castellan, 1988) to search for differences between each of the measurement times (T1 and T2) for each group (experimental and control).

Results

In the interest of brevity, only significant results ($p < .05$) or results trending toward significance ($p < .10$) are presented in Tables 3 to 5. The strategy numbers presented in Tables 3, 4, and 5 refer to those in Table 1. Specifically, Table 3 displays changes in teachers’ beliefs regarding motivational strategies to support the need for autonomy between the beginning and the end of the school year. Table A1 in the Appendix gives descriptive statistics for these strategies.

As Table 3 shows, teachers’ beliefs about the feasibility and normality of “acknowledging students’ interests, feelings, and perspective” showed significant positive change only in the experimental group. We observed the same positive trend ($p < .10$) for their beliefs about the feasibility and normality of “explaining the importance, utility, and significance of tasks and exercises” and the normality of “offering opportunities to involve students in the course review.” As for teachers in the control group, we observed a negative trend for their beliefs regarding the feasibility and normality of “offering students the opportunity to practice independently and solve problems on their own, without interference.” In other words, teachers’ beliefs were less favorable regarding this strategy near the end of the school year, which was not the case for those who took part in the training.

Table 3*Changes in Teachers' Beliefs Regarding Motivational Strategies Supporting the Need for Autonomy*

Motivational strategies supporting the need for autonomy	EG <i>Z</i>	CG <i>Z</i>
1. Acknowledge students' interests, feelings, and perspective.		
Feasibility	T2 > T1; -2.121, <i>p</i> = .034	-1.000, <i>p</i> = .317
Normality	T2 > T1; -2.121, <i>p</i> = .034	-1.342, <i>p</i> = .180
3. Explain tasks and exercises' importance, utility, and significance.		
Feasibility	T2 > T1; -1.732, <i>p</i> = .083	-1.414, <i>p</i> = .157
Normality	T2 > T1; -1.633, <i>p</i> = .102	-1.414, <i>p</i> = .157
5. Give students the opportunity to practice independently and solve problems on their own, without interfering.		
Feasibility	-1.414, <i>p</i> = .157	T2 < T1; -1.633, <i>p</i> = .102
Normality	-1.000, <i>p</i> = .317	T2 < T1; -1.732, <i>p</i> = .083
7. Provide opportunities to involve students in the course review.		
Feasibility	T2 > T1 ; -1.890, <i>p</i> = .059	-0.552, <i>p</i> = .581

Note. EG = experimental group; CG = control group; T1 = first measurement time in October 2018; T2 = second measurement time in April 2019.

Table 4

Changes in Teachers' Beliefs Regarding Motivational Strategies Supporting the Need for Competence (Structure and Mastery)

Motivational strategies supporting the need for competence	EG Z	CG Z
Structure (SDT)		
2. Give clear (verbal) instructions.		
Feasibility	T2 > T1; -1.732, $p = .083$	-1.000, $p = .317$
4. Verify students' follow up on (verbal) instructions.		
Normality	T2 > T1; -2.060, $p = .039$	-1.000, $p = .317$
5. Offer help and give tips and advice during activities.		
Feasibility	T2 > T1; -1.633, $p = .102$	T2 < T1; -1.633, $p = .102$
Mastery (AGT)		
1. Demonstrate task and/or use students as positive "role models."		
Normality	-1.000, $p = .317$	T2 < T1; -1.732, $p = .083$
5. Emphasize/recognize effort and/or improvement.		
Normality	T2 > T1; -1.656, $p = .098$	-.577, $p = .564$
6. Use cooperative learning.		
Feasibility	T2 > T1; -1.633, $p = .102$	-1.000, $p = .317$
Normality	T2 > T1; -1.633, $p = .102$	-1.000, $p = .317$

Note. EG = experimental group; CG = control group; T1 = first measurement time in October 2018; T2 = second measurement time in April 2019.

Table 4 presents changes in teachers' beliefs regarding motivational strategies to support the need for competence between the beginning and end of the school year on the basis of structure (SDT) and mastery (AGT). Table A2 in the Appendix lists descriptive statistics for these strategies.

As Table 4 shows, teachers' beliefs about the normality of "verifying students' follow-up on (verbal) instructions" displayed a significant positive change in the experimental group only. We observed the same positive trend ($p < .10$) in the experimental group for teachers' beliefs regarding the feasibility of "giving clear (verbal) instructions," the normality of "emphasizing/recognizing effort and/or improvement," and the feasibility and normality of "using cooperative learning." As for teachers' beliefs about "offering help and giving tips and advice during activities," we observed a positive trend in the experimental group, whereas this trend was negative between the two measurement points for the control group. In other words, the beliefs of teachers in the experimental group tended to be more favorable toward the feasibility of this strategy after the training course, whereas those of teachers in the control group tended to be less favorable at the second measurement time. We also observed a negative trend in the control group regarding PE teachers' beliefs about the normality of "demonstrating the task on their own and/or using students as positive "role models," which was not the case for teachers in the experimental group.

Table 5 presents changes in teachers' beliefs about motivational strategies to support the need for relatedness between the beginning and the end of the school year. Table A3 in the Appendix presents descriptive statistics for these strategies.

As Table 5 indicates, there were no significant changes in teachers' beliefs regarding motivational strategies supporting students' relatedness. However, the belief about the normality of "adopting a warm communication style" displayed a positive trend in the experimental group, whereas the normality of "engaging in non-instructional conversation with students" displayed a positive trend in the control group.

Table 5*Changes in Teachers' Beliefs Regarding Motivational Strategies Supporting the Need for Relatedness*

Motivational strategies supporting the need for relatedness	EG <i>Z</i>	CG <i>Z</i>
4. Adopt a warm communication style.		
Normality	T2 > T1; -1.841, $p = .066$	-1.414, $p = .157$
5. Engages in non-instructional conversation with students.		
Normality	-.557, $p = .577$	T2 > T1; -1.732, $p = .083$

Note. EG = experimental group; CG = control group; T1 = first measurement time in October 2018; T2 = second measurement time in April 2019.

Discussion

Teachers' beliefs regarding the adoption of strategies likely to support students' needs fulfillment and self-determination in PE play a crucial role (Bureau et al., 2021; Reeve et al., 2014) in supporting student needs. This investigation's results of PE teacher attendance at a 2-day training course spread over 3 days during a school year and its effect on their beliefs in terms of empowering motivational strategies support our hypothesis only in part: The results show no changes in teachers' belief about the effectiveness of motivational strategies in the experimental and control groups. However, the results reveal some positive changes in their beliefs about the feasibility and normality of some motivational strategies in the experimental group. Interestingly, it is mainly beliefs related to supporting competence (5 of 13) and autonomy (3 of 7) needs that evolve favorably, since the results of a recent meta-analysis show that satisfaction of the need for competence followed by satisfaction of the need for autonomy are the most positive predictors of students' self-determined motivation (Bureau et al., 2021).

The absence of changes in belief about the effectiveness of the motivational strategies during training is quite surprising given our expectation that participation in the training course would "convince" teachers of their effectiveness, as in the case in of studies on autonomy support and structure (Aelterman et al., 2014; Aelterman et al., 2016). However, a profound change in beliefs requires frequent and long-term support (Desimone, 2009). Although the scientific literature has not yet identified an ideal duration, antecedent research has shown support for a professional development spread over a semester at least and including 20 hr or more of contact time (Desimone, 2009). The fact our study contains only one experiment with feedback from the educational consultant may explain the absence of change for this type of belief. In addition, teachers may not have had the opportunity to observe the direct impact of motivational strategies on students' motivation and engagement during PE classes. It may be that teachers require a more frequent and closer monitoring of their practice to consider a strategy effective. Indeed, if teachers are to feel their efforts genuinely affect students' motivation, they must know not only what strategy to use but also how to use it (in what context) and how to react when the desired results are

not achieved. As well, it is possible that a strategy that supports one need may thwart another at the same time, giving the impression it is ineffective. As an example, offering students too many choices (support for autonomy) may leave them without a concrete understanding of teachers' expectations, which may in turn impede their need for competence (structure). In that situation, teachers might conclude that the strategy is ineffective, whereas it may be effective if used differently (e.g., offer limited choices about the order, pace, and difficulty of tasks).

In addition, certain types of changes are easier to elicit (Desimone & Garet, 2015), meaning that during professional development it may be easier to change teachers' procedures than their underlying representations. In this sense, training appears effective for changing teachers' beliefs about the feasibility of strategies in terms of their practical application. In other words, even though the training course did not convince teachers of the effectiveness of empowering motivational strategies, it made them realize they could implement these strategies during their PE lesson, a gain in itself. Indeed, watching and analyzing videos of PE teachers applying these strategies in real life with real students in different types of classes (e.g., ordinary or special education, individual and collective sports) definitely helps convince teachers these strategies can be easily implemented in day-to-day practice. This is because teachers find it easier to alter specific behaviors or routines that do not call for new knowledge (Desimone & Garet, 2015) given they must ascertain a strategy's effect. For example, even if a teacher recognizes the feasibility of acknowledging students' interests, feelings, and perspective, failure to do so or to justify why it cannot be done (i.e., provide a rationale) may make a strategy seem ineffective. This reasoning may explain why teachers find that, although this strategy is easier to implement, it is no more effective than before training. However trial and error and close monitoring may be necessary for teachers to recognize the effectiveness of the strategy on students' motivation.

At first, it may appear surprising that teachers' belief in the normality of some motivational strategies is positive given this belief represents their perception of the surrounding norm. Nevertheless, participation in training may make teachers aware of the existence of these practices and their use by colleagues. Indeed, it may be the first time they realize the effect of such strategies on students' motivation.

Finally, training may focus more on the possible implementation of strategies (feasibility and normality) than on their anticipated effect on PE students (effectiveness). Although the training focuses secondarily on the signs of engagement and disengagement with a discussion on the second day of training and the strategies being chosen on the basis of needs of targeted students, the majority of the course content addresses the application of these strategies, with particular attention given to analysis of videos of their implementation by teachers in real physical education settings.

In interpretation of these results, there are certain limitations for consideration. First, despite the presence of a control group, the voluntary, rather than randomized, basis of teachers joining each group may have biased the results. There are differences, however, between the two groups, suggesting the training may be responsible for the trends observed. As well, the sample is quite small, and it is possible that results from a larger sample may reach statistical significance. Finally, use of a single-item questionnaire does not allow for internal consistency measures. Nevertheless, we feel justified in treating each strategy as an item instead of providing a score for all one-dimensional strategies relative to motivational climate to gain better insight into teachers' beliefs regarding each one.

It would be interesting for a study to evaluate the impact of this training on more PE teachers to see if these results can be replicated in a larger sample. Additionally, interviewing teachers before and after the course regarding their beliefs may supply information to refine our understanding of the results. It would be particularly relevant to understand normality and its definition regarding creating an empowering motivational climate in the various contexts in which PE teachers evolve.

Conclusion

Despite only a few significant differences, results demonstrate a favorable trend regarding the beliefs of teachers in the experimental group or point to a buffer effect, at least, on the negative trend sometimes observed in the control group. Accordingly, professional development appears to be the appropriate avenue for helping teachers internalize this promising teaching approach (Reeve et al., 2014).

References

- Aelterman, N., Vansteenkiste, M., Van den Berghe, L., De Meyer, J., & Haerens, L. (2014). Fostering a need-supportive teaching style: Intervention effects on physical education teachers' beliefs and teaching behaviors. *Journal of Sport & Exercise Psychology, 36*(6), 595–609. <https://doi.org/10.1123/jsep.2013-0229>
- Aelterman, N., Vansteenkiste, M., Van Keer, H., De Meyer, J., Van den Berghe, L., & Haerens, L. (2013). Development and evaluation of a training on need-supportive teaching in physical education: Qualitative and quantitative findings. *Teaching and Teacher Education, 29*, 64–75. <https://doi.org/10.1016/j.tate.2012.09.001>
- Aelterman, N., Vansteenkiste, M., Van Keer, H., & Haerens, L. (2016). Changing teachers' beliefs regarding autonomy support and structure: The role of experienced psychological need satisfaction in teacher training. *Psychology of Sport and Exercise, 23*, 64–72. <https://doi.org/10.1016/j.psychsport.2015.10.007>
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes, 50*(2), 179–211. [https://doi.org/10.1016/0749-5978\(91\)90020-T](https://doi.org/10.1016/0749-5978(91)90020-T)
- Alvarez-Bueno, C., Pesce, C., Cavero-Redondo, I., Sanchez-Lopez, M., Martinez-Hortelano, J. A., & Martinez-Vizcaino, V. (2017). The effect of physical activity interventions on children's cognition and metacognition: A systematic review and meta-analysis. *Journal of the American Academy of Child & Adolescent Psychiatry, 56*(9), 729–738. <https://doi.org/10.1016/j.jaac.2017.06.012>
- Ames, C., & Archer, J. (1988). Achievement goals in the classroom: Students' learning strategies and motivation processes. *Journal of Educational Psychology, 80*(3), 260–267. <https://doi.org/10.1037/0022-0663.80.3.260>
- Bernstein, E., Herman, A. E., & Lysniak, U. (2013). Beliefs of pre-service teachers toward competitive activities and the effect on implementation and planning for physical education classes. *Teacher Education Quarterly, 40*(4), 63–79.
- Biddle, S. J. H., Ciaccioni, S., Thomas, G., & Vergeer, I. (2019). Physical activity and mental health in children and adolescents: An updated review of reviews and an analysis of causality. *Psychology of Sport and Exercise, 42*, 146–155. <https://doi.org/10.1016/j.psychsport.2018.08.011>

- Bureau, J. S., Howard, J. L., Chong, J. X. Y., & Guay, F. (2021). Pathways to student motivation: A meta-analysis of antecedents of autonomous and controlled motivations. *Review of Educational Research*. Advance online publication. <https://doi.org/10.3102/003465432111042426>
- Comité scientifique de Kino-Québec. (2012). *Opération ados : des activités qui répondent à leurs goûts* [Teenagers' operation: Activities to suit their tastes]. <http://www.kino-quebec.qc.ca/publications/operationados.pdf>
- Darling-Hammond, L., Hyler, M. E., & Gardner, M. (2017). *Effective teacher professional development*. Learning Policy Institute. <https://doi.org/10.54300/122.311>
- Deci, E. L., & Ryan, R. M. (2000). The “what” and “why” of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, 11(4), 227–268. https://doi.org/10.1207/S15327965PLI1104_01
- De Meester, A., Van Duyse, F., Aelterman, N., Muynck, G.-J., & Haerens, L. (2020). An experimental, video-based investigation into the motivating impact of choice and positive feedback among students with different motor competence levels. *Physical Education and Sport Pedagogy*, 25(4), 1–18. <https://doi.org/10.1080/17408989.2020.1725456>
- Desimone, L. M. (2009). Improving impact studies of teachers' professional development: Toward better conceptualizations and measures. *Educational Researcher*, 38(3), 181–199. <https://doi.org/10.3102/0013189x08331140>
- Desimone, L. M., & Garet, M. S. (2015). Best practices in teachers' professional development in the United States. *Psychology, Society, and Education*, 7(3), 252–263. <https://doi.org/10.3102/0013189X08331140>
- Dornstauder, D., & Chorney, D. (2019). Shifting the focus for professional development in health and physical education. *PHE Journal*, 85(1), 1–13.
- Duda, J. L. (2013). The conceptual and empirical foundations of Empowering Coaching™: Setting the stage for the PAPA project. *International Journal of Sport and Exercise Psychology*, 11(4), 311–318. <https://doi.org/10.1080/1612197X.2013.839414>
- Dunton, G. F., Do, B., & Wang, S. D. (2020). Early effects of the COVID-19 pandemic on physical activity and sedentary behavior in children living in the U.S. *BMC Public Health*, 20(1), 1–13. <https://doi.org/10.1186/s12889-020-09429-3>

- Elliot, A. J., & Church, M. A. (1997). A hierarchical model of approach and avoidance achievement motivation. *Journal of Personality and Social Psychology*, 72(1), 218–232. <https://doi.org/10.1037/0022-3514.72.1.218>
- Fortin, M.-F., & Gagnon, J. (2016). *Fondements et étapes du processus de recherche : Méthodes quantitatives et qualitatives* [Foundations and stages of the process: Quantitative and qualitative methods] (M.-F. Fortin & J. Gagnon, Eds., 3rd ed.). Chenelière Éducation.
- Girard, S., & Lemoyne, J. (2018). Analyzing the contribution of student-perceived motivational climate to predict student goal adoption in physical education: Testing invariance relative to teacher-induced climate. *The Physical Educator*, 75(4), 701–724. <https://doi.org/10.18666/TPE-2018-V75-I4-8197>
- Girard, S., Desbiens, J.-F., & Hogue, A.-M. (2021). Effects of a training course on creation of an empowering motivational climate in physical education: A quasi-experimental study. *Physical Education and Sport Pedagogy*, 28(1), 56–75. <https://doi.org/10.1080/17408989.2021.1953457>
- Girard, S., St-Amand, J., & Chouinard, R. (2019). Motivational climate in physical education, achievement motivation, and physical activity: A latent interaction model. *Journal of Teaching in Physical Education*, 38(4), 305–315. <https://doi.org/10.1123/jtpe.2018-0163>
- Haerens, L., Krijgsman, C., Mouratidis, A., Borghouts, L., Cardon, G., & Aelterman, N. (2018). How does knowledge about the criteria for an upcoming test relate to adolescents' situational motivation in physical education? A self-determination theory approach. *European Physical Education Review*, 25(4), 983–1001. <https://doi.org/10.1177/1356336X18783983>
- Haerens, L., Vansteenkiste, M., De Meester, A., Delrue, J., Tallir, I., Vande Broek, G., Goris, W., & Aelterman, N. (2018). Different combinations of perceived autonomy support and control: Identifying the most optimal motivating style. *Physical Education and Sport Pedagogy*, 23(1), 16–36. <https://doi.org/10.1080/17408989.2017.1346070>
- Harwood, C. G., Keegan, R. J., Smith, J. M. J., & Raine, A. S. (2015). A systematic review of the intrapersonal correlates of motivational climate perceptions in sport and physical activity. *Psychology of Sport and Exercise*, 18, 9–25. <https://doi.org/10.1016/j.psychsport.2014.11.005>

- Hattie J. (2009). *Visible learning: A synthesis of over 800 meta-analyses relating to achievement*. Routledge.
- Hattie J. (2012). *Visible learning for teachers: Maximizing impact on learning*. <https://doi.org/10.4324/9780203181522>
- Howell, D. C. (2008). *Méthodes statistiques en sciences humaines* [Statistical methods in human sciences] (2nd ed.). De Boeck.
- Martins, J., Marques, A., Sarmento, H., & Carreiro da Costa, F. (2015). Adolescents' perspectives on the barriers and facilitators of physical activity: A systematic review of qualitative studies. *Health Education Research*, 30(5), 742–755. <https://doi.org/10.1093/her/cyv042>
- Mercier, K., Donovan, C., Gibbone, A., & Rozga, K. (2017). Three-year study of students' attitudes toward physical education: Grades 4–8. *Research Quarterly for Exercise and Sport*, 88(3), 307–315. <https://doi.org/10.1080/02701367.2017.1339862>
- Ministère de l'Éducation. (2020). *Référentiel de compétences professionnelles, profession enseignante* [Reference framework for professional competencies, for teachers]. https://cdn-contenu.quebec.ca/cdn-contenu/adm/min/education/publications-adm/devenir-enseignant/referentiel_competchances_professionnelles_profession_enseignante.pdf?1606848024
- Murayama, K., Kitagami, S., Tanaka, A., & Raw, J. A. L. (2017). People's naiveté about how extrinsic rewards influence intrinsic motivation. *Motivation Science*, 2(3), 138–142. <https://doi.org/10.1037/mot0000040>
- Pajares, M. F. (1992). Teachers' beliefs and educational research: Cleaning up a messy construct. *American Educational Research Association*, 62(3), 307–332. <https://doi.org/10.3102/00346543062003307>
- Rachele, J., Cuddihy, T., Washington, T., & McPhail, S. (2016). School-based youth physical activity promotion: Thoughts and beliefs of pre-service physical education teachers. *Australian Journal of Teacher Education*, 41(5), 52–64. <https://doi.org/10.14221/ajte.2016v41n5.4>
- Reeve, J. (2009). Why teachers adopt a controlling motivating style toward students and how they can become more autonomy supportive. *Educational Psychologist*, 44(3), 159–175. <https://doi.org/10.1080/00461520903028990>

- Reeve, J., & Cheon, S. H. (2016). Teachers become more autonomy supportive after they believe it is easy to do. *Psychology of Sport and Exercise*, 22, 178–189. <https://doi.org/10.1016/j.psychsport.2015.08.001>
- Reeve, J., Vansteenkiste, M., Assor, A., Ahmad, I., Cheon, S. H., Jang, H., Kaplan, H., Moss, J. D., Olausson, B. S., & Wang, C. K. J. (2014). The beliefs that underlie autonomy-supportive and controlling teaching: A multinational investigation. *Motivation and Emotion*, 38(1), 93–110. <https://doi.org/10.1007/s11031-013-9367-0>
- Richard, M. (2020). Le rôle du développement professionnel dans la mise en œuvre du modèle de la réponse à l'intervention. *Enfance en difficulté*, 7, 51–79. <https://doi.org/10.7202/1070383ar>
- Rocamora, I., González-Villora, S., Fernández-Río, J., & Arias-Palencia, N. M. (2019). Physical activity levels, game performance and friendship goals using two different pedagogical models: Sport Education and Direct Instruction. *Physical Education and Sport Pedagogy*, 24(1), 87–102. <https://doi.org/10.1080/17408989.2018.1561839>
- Sarrazin, P., Tessier, D., & Trouilloud, D. (2006). Climat motivationnel instauré par l'enseignant et implication des élèves en classe: l'état des recherches [The establishment of a motivational environment by the teacher and student involvement in class: A survey of the latest research]. *Revue française de pédagogie*, 157(4), 12–12. <https://doi.org/10.4000/rfp.463>
- Shahidi, S., Stewart Williams, J., & Hassani, F. (2020). Physical activity during COVID-19 quarantine. *Acta Paediatrica*, 109(10), 2147–2148. <https://doi.org/10.1111/apa.15420>
- Siegel, S., & Castellan, N. J., Jr. (1988). *Nonparametric statistics for the behavioral sciences* (2nd ed.). McGraw-Hill Book Company.
- Skinner, E. A., & Belmont M. J. (1993) Motivation in the classroom: Reciprocal effects of teacher behavior and student engagement across the school year. *Journal of Educational Psychology*, 85(4), 571–581. <https://doi.org/10.1037/0022-0663.85.4.571>
- Van den Berghe, L., Cardon, G., Tallir, I., Kirk, D., & Haerens, L. (2016). Dynamics of need-supportive and need-thwarting teaching behavior: The bidirectional relationship with student engagement and disengagement in the beginning of a lesson. *Physical Education and Sport Pedagogy*, 21(6), 653–670. <https://doi.org/10.1080/17408989.2015.1115008>

Table A1*Descriptive Statistics for Strategies Supporting the Need for Autonomy*

Motivational strategies supporting the need for autonomy	EG				CG			
	T1		T2		T1		T2	
	<i>M (SD)</i>	Min-max	<i>M (SD)</i>	Min-max	<i>M (SD)</i>	Min-max	<i>M (SD)</i>	Min-max
1. Acknowledge students' interests, feelings and perspective.								
Feasibility	3.17 (.75)	2-4	4.17 (.75)	3-5	4.00 (.71)	3-5	4.20 (.45)	4-5
Normality	2.50 (.55)	2-3	3.50 (1.05)	2-5	3.80 (.84)	3-5	4.40 (.55)	4-5
3. Explain tasks' and exercises' importance, utility, and significance.								
Feasibility	4.17 (.98)	3-5	4.67 (.52)	4-5	4.40 (.55)	4-5	4.00 (.71)	3-5
Normality	3.17 (1.17)	1-4	4.00 (.89)	3-5	4.00 (1.00)	3-5	4.40 (.55)	4-5
5. Give students the opportunity to practice independently and solve problems on their own, without interfering.								
Feasibility	4.33 (.52)	4-5	4.00 (.63)	3-5	4.40 (.55)	4-5	3.60 (.55)	3-4
Normality	3.50 (.84)	2-4	3.83 (.75)	3-5	4.40 (.55)	4-5	3.80 (.45)	3-4
7. Provide opportunities to involve students in the course review.								
Feasibility	3.33 (.52)	3-4	4.17 (.98)	3-5	3.75 (1.50)	2-5	3.20 (1.10)	2-5

Table A2*Descriptive Statistics for Strategies Supporting the Need for Competence*

Motivational strategies supporting the need for competence	EG				CG			
	T1		T2		T1		T2	
	<i>M (SD)</i>	Min-max	<i>M (SD)</i>	Min-max	<i>M (SD)</i>	Min-max	<i>M (SD)</i>	Min-max
Structure (SDT)								
2. Give clear (verbal) instructions.								
Feasibility	4.50 (.55)	4-5	5.00 (.00)	5-5	5.00 (.00)	5-5	4.90 (.45)	4-5
4. Verify students' follow-up on (verbal) instructions.								
Normality	3.00 (.89)	2-4	4.33 (.82)	3-5	4.40 (.89)	3-5	4.60 (.55)	4-5
5. Offer help and give tips and advice during activities.								
Feasibility	(.75)	3-5	4.83 (.41)	4-5	5.00 (.00)	5-5	4.20 (.84)	3-5
Mastery (AGT)								
1. Demonstrate task and/or use students as positive "role models."								
Normality	4.33 (.82)	3-5	4.17 (1.17)	2-5	4.80 (.45)	4-5	4.20 (.84)	3-5
5. Emphasize/recognize effort and/or improvement.								
Normality	3.50 (.84)	3-5	4.50 (.84)	3-5	4.60 (.55)	4-5	4.40 (.55)	4-5
6. Use cooperative learning.								
Feasibility	3.50 (.84)	3-5	4.17 (.75)	3-5	4.00 (.71)	3-5	3.80 (.84)	3-5
Normality	3.33 (1.03)	2-5	4.00 (.89)	3-5	3.80 (.84)	3-5	3.60 (.89)	3-5

Table A3*Descriptive Statistics for Strategies Supporting the Need for Relatedness*

Motivational strategies supporting the need for relatedness	EG				CG			
	T1		T2		T1		T2	
	<i>M (SD)</i>	Min-max	<i>M (SD)</i>	Min-max	<i>M (SD)</i>	Min-max	<i>M (SD)</i>	Min-max
4. Adopt a warm communication style.								
Normality	3.33 (1.03)	2-4	4.50 (.55)	4-5	4.40 (.89)	3-5	4.80 (.45)	4-5
5. Engage in non-instructional conversations with students.								
Normality	3.67 (1.03)	2-5	4.00 (.63)	3-5	4.00 (1.00)	3-5	4.60 (.55)	4-5