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Social Contagion of Motivation Between Teacher and Student:

Analyzing Underlying Processes

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Abstract

We examined (a) whether motivational orientation can spread from teachers to students during two consecutive teaching-learning sessions and (b) mechanisms underlying this phenomenon in a special physical education session delivered to high school students. Participants who were taught a sport activity by an allegedly paid instructor reported lower interest in learning and exhibited less persistence in a free choice period than students taught by a supposedly volunteer instructor, despite receiving the same standardized lesson across experimental conditions. When participants taught the activity to their peers in a subsequent unconstrained learning session, lower levels of interest and behavioral persistence were also exhibited by learners who received the second lesson. A structural equation model confirmed that learners at the end of this educational chain made inferences about how intrinsically motivated their peer tutor was based on their teaching style (i.e., autonomy-supportive behaviors) and the positive affects they displayed. These inferences, in turn, affected their own intrinsic motivation for the activity. Results are interpreted in relation to self-determination theory, and practical implications of the findings are discussed.

Keywords: social contagion; intrinsic motivation; self-determination theory; teaching style.

Social Contagion of Motivation Between Teacher and Student:

Analyzing Underlying Processes

In a wide variety of life domains, adaptive behaviors and well-being are fostered by intrinsic motivation (IM), defined as engaging in activities for their ‘own sake’ and because of the inherent satisfaction of doing so, rather than the achievement of rewards, sanctions, or other consequences (Deci & Ryan, 1985; 2002). For example, in physical education class, it has been shown that the more students are intrinsically motivated, the more they report feelings of vitality (Mouratidis, Vansteenkiste, Lens, & Sideridis, 2008), positive affect (Standage, Duda, & Ntoumanis, 2005), interest (Goudas, Biddle, & Fox, 1994), self-esteem (Standage & Gillison, 2007), health-related quality of life (Standage & Gillison, 2007), concentration (Ntoumanis, 2005), effort and persistence (Ferrer-Caja & Weiss, 2000; Ntoumanis, 2001; Standage, Duda, & Ntoumanis, 2006), preference for challenging tasks (Standage et al., 2005) and intention to partake in physical activity outside of physical education (Ntoumanis, 2005).

A large literature demonstrates that IM is supported or undermined by social factors. In educational contexts in general (see Deci & Ryan, 1985; Reeve, Deci, & Ryan, 2004; Reeve & Jang, 2006; Ryan & Deci, 2000, for reviews) as in physical education class (see Ntoumanis & Standage, 2009, for review), it has been demonstrated that when students are exposed to autonomy-supportive teacher behaviors, this promotes IM for learning. Conversely, when students are exposed to controlling teacher behaviors, this undermines IM for learning. Self-Determination Theory (SDT; Deci & Ryan, 2002) accounts for these effects by proposing that educational contexts influence the extent to which psychological needs for autonomy, competence, and relatedness are met. Thus, teachers who listen carefully to students and acknowledge their perspectives, provide meaningful rationale for learning tasks, and allow them

opportunities to exercise choice support students' need for autonomy, which in turn strengthens their IM for learning. Conversely, teachers who use directives or commands, provide solutions before students have time to reflect by themselves, or attempt to motivate students by exerting pressure on them (e.g., by using threats, criticisms and deadlines) undermine students' need for autonomy, which in turn reduces their IM for learning (Reeve, Bolt, & Cai, 1999; Reeve & Jang, 2006; Ryan & Deci, 2000).

An implicit assumption in the research reviewed above is that objective differences in autonomy-supportive or controlling instructional styles is the fundamental mechanism or 'final common pathway' influencing students' IM. As such, teacher's influence on students' motivation has been almost exclusively examined through the utilization of different teaching styles. However, recent findings might suggest another way that teachers can influence students' motivation. Specifically, several studies have reported that students' motivation can depend on the motivation of their teacher (Atkinson, 2000; Roth, Assor, Kanat-Maymont, and Kaplan, 2007). For example, exposing students to differently motivated teachers, Atkinson (2000) showed that students were more motivated for their technology class when they were taught by highly motivated teachers in comparison to students taught by less motivated teachers. This effect of teacher's motivation on students' motivation could be the result of the teaching style (Roth et al., 2007), since intrinsically motivated teachers are more prone to adopt an autonomy supportive style (e.g., Pelletier, Séguin-Lévesque, & Legault, 2002); however, this finding could also represent another kind of influence of teacher motivation, since the mere perception of teachers' motivation could also convey relevant information on needs satisfaction. The present research aims to take a closer look on the relation between teacher's motivation and students'

motivation in order to determine the mechanisms through which teachers' motivation may influence students' motivation.

Social Contagion of Motivation for Learning

A specific line of research has shown that autonomy-supportive or controlling teacher behaviors are sufficient, but not necessary, to influence students' IM for learning. In fact, the same effects on students' IM can be elicited merely by inferring the motives of a teacher and holding instructional style constant (Wild, Enzle, & Hawkins, 1992; Wild, Enzle, Nix, & Deci, 1997). For example, Wild et al. (1992) taught individual piano lessons to musical novices. In an intrinsic motivation condition, the teacher was characterized as a volunteer, and a letter of appreciation was given to the teacher prior to the start of the lesson. Conversely, in an extrinsic motivation condition, the teacher was characterized as a paid employee, and a letter of appreciation along with \$25 was given to the teacher prior to the lesson. The teacher was blinded to this manipulation and subsequently delivered a standardized lesson to students in both conditions, using a neutral instructional style that was neither controlling nor autonomy supportive. Students who believed that their teacher was intrinsically motivated reported more enjoyment and positive affect while engaging in the lesson, were more interested in further learning, and exhibited greater exploratory activity in a free-play period compared to students who believed that their instructor was extrinsically motivated. This was found despite the fact that students received identical lessons and demonstrated equivalent skill acquisition level across conditions.

Wild et al. (1997, Study 2) replicated and extended this effect by adding a second teaching-learning situation to the procedure to determine whether motivational orientation toward learning could spread from student to student in a second, unconstrained, learning

session. This study replicated the perceived teacher motivation manipulation used by Wild et al. (1992) using a different learning task. First generation learners were then asked to teach a second participant the same skill in an unconstrained peer education session. An inferential effect was observed in the initial teaching session: first generation learners who believed that their teacher was intrinsically motivated (i.e., a volunteer) reported greater levels of enjoyment and interest in learning, compared to learners who believed that their teacher was extrinsically motivated (i.e., a paid employee), despite being exposed to identical lessons that were neither controlling nor autonomy supportive. In addition, lower levels of task enjoyment, interest in learning, and positive mood were also reported by second-generation learners in this educational chain. Wild et al. (1997) suggested that social contagion of motivational orientations toward learning can affect new students during serial teaching and learning episodes.

Expectancy Formation Processes Underlying Social Contagion Effects

How might contextual information about a teacher influence students' IM for learning in the absence of objective differences in autonomy-supportive and controlling instructional styles? Wild et al.'s (1992) study demonstrated that third-party information about the paid or voluntary status of a teacher is associated with student inferences that the teacher is extrinsically or intrinsically motivated, respectively. Elaborating on these findings, Wild et al. (1997) proposed an expectancy-based mechanism linking contextual information about a teacher's motivation to students' own IM. On this theoretical extension of SDT (Wild & Enzle, 2002), inferences about others' motives for engaging in an activity elicits expectations with regard to quality of task engagement (interest, pleasure) and quality of interpersonal relationships (autonomy support, relatedness) that are likely to ensue during social interactions. These expectations modify perceptions of the target activity and interpersonal context when one actually engages in the task.

Wild et al. (1997, Study 1) devised a story comprehension task to test whether exposure to extrinsically versus intrinsically motivated interpersonal targets differentially cues expectations about task engagement and interpersonal relations. Participants were randomly assigned to read a short vignette depicting a protagonist who, as in the studies described earlier, engaged in an activity supposedly as a volunteer or as a paid employee. All other aspects of the vignette were identical across conditions. Immediately after reading the story, participants answered an open-ended question assessing why the protagonist engaged in the activity, and their responses were coded with respect to perceived intrinsic and extrinsic motivation (e.g., “because it was fun”; “for the money”). Participants then rated their own expectations about interest in the activity and quality of interpersonal relations with the protagonist. Compared to participants who read about a volunteer, participants who read about a paid employee expected that (a) the target enjoyed the target activity less, (b) there would be less psychological relatedness between them and the target, and (c) engaging in the activity themselves would be less enjoyable and valued, and associated with less positive affect. Mediation analyses indicated that these effects were completely mediated by inferences about the motivation of the target, i.e., effects of knowing that the target was paid or a volunteer on expected quality of task engagement and interpersonal relations were eliminated when perceived motivation of the target was controlled.

These results suggest that inferences about a teacher’s motivation affects students’ own IM toward learning via expectancy formation processes. The social contagion of motivation model (Wild & Enzle, 2002) proposes that if students believe that their teacher engages in instruction primarily for intrinsic reasons, they will *self-generate* expectations about high levels of autonomy support from the teacher and high quality of interpersonal relations with the teacher, compared to students who believe that their teacher is engaged primarily for the extrinsic

rewards related to his/her job. In turn, these expectancies will influence students' own perceptions of the educational interaction. On this model, then, teaching behaviors will be more likely interpreted as supporting psychological needs for autonomy and relatedness among students who believe that a teacher is intrinsically motivated, compared to students who believe that teacher is extrinsically motivated – even if students in both cases receive standardized instruction that is objectively neutral with respect to autonomy supportive or controlling teacher behaviors.

Rationale for the Present Study

Although contextual cues and expectancies can influence learners' IM without exposure to objective differences in autonomy- supportive or controlling teacher behaviors, there are several limitations associated with this line of research. First, ecological validity of the teaching and learning tasks used by Wild et al. (1992, 1997) was low, since individual piano and magic lessons were delivered by confederate teachers to undergraduates who participated in an introductory psychology experiment in exchange for course credit. Consequently, it is unknown whether the social contagion effects on first and second-generation learners described earlier could be replicated in a field setting involving actual students and teachers. Second, the outcome variables used in the Wild et al. (1997) study to assess IM among learners were limited to self-reports (i.e., ratings of task enjoyment, affective reactions and interest in learning). This is inconsistent with recommendations to complement self-report measures with behavioral measures of IM (Ryan & Deci, 2000). As a result, it has not been definitively established that second-generation effects of perceived teacher motives on learner IM extend to behavioral persistence in a free-choice period. Third, although social contagion of motivation for first generation learners can be explained by expectancies formed on the basis of third-party

information about the teacher's motives, this explanation is not tenable for the second generation learning results reported by Wild et al. (1997), since no information on the confederate teacher's motivation, nor the first generation learner's motivation was communicated to students at the end of the serial teaching-learning procedure. One possibility is that first generation learners who had been taught by a supposedly extrinsically motivated instructor experienced low levels of enjoyment and interest during the second teaching session, perhaps saying or doing something to communicate their extrinsically motivated orientation toward the activity to second generation learners. Alternatively, first generation learners who were more extrinsically motivated may have delivered their lesson to second-generation learners using a more controlling teaching style. This latter possibility is consistent with research reviewed earlier showing that a teacher's motivation is an important determinant of their instructional style (e.g., Pelletier et al., 2002). Unfortunately, no research to date has examined these alternatives, and so it is important to replicate and extend Wild et al.'s (1997) results by studying teachers' behaviors exhibited during second generation instruction to identify the locus of social contagion effects during naturally occurring teaching and learning episodes.

Research Objectives and Hypotheses

The first goal of this study was to replicate the effect described previously (Wild et al., 1992; Wild et al., 1997) showing that exposure to cues about a teacher's motivation can affect students' own interest in the activity independently of teaching activities per se. To address the limitations identified earlier, a different learning task was used within a more ecologically valid educational context. Specifically, we examined teaching and learning using a novel sport activity in high school physical education classes. Sport activities are considered to be intrinsically motivating for many students (Siedentop & Tannehill, 2000), especially when they are new. We

devised a cover story to justify the use of an external instructor in order to integrate an experimental design into this field setting. The use of external instructors is not a frequent practice in most schools (except for substitute teaching), but this procedure allowed us to preserve some ecologically valid features of regular school teaching such as group instruction. We also added a behavioral measure of IM to determine whether social contagion of motivation would be observed on free time activity as well as self-reported IM.

Hypothesis 1 (H1; inference effect): We predicted that, despite exposure to a standardized lesson across conditions, IM for the task would be greater among first generation learners who believe that their instructor is a volunteer, compared to first generation learners who believe that their instructor is a paid employee.

Hypothesis 2 (H2; social contagion effect): We predicted the first generation learners' IM for the target activity would spread to second-generation learners in a subsequent teaching session. Specifically, we predicted that IM toward the task would be greater among second generation learners who were taught by first generation learners who believed that their instructor is a volunteer, compared to second generation learners taught by first generation learners who believed that their instructor is a paid employee.

The second goal of this study was to explore mediator of motivation contagion by establishing how students infer teacher's motivation for engaging in instruction. Because previous research has established that third-party information about the voluntary or paid status of a teacher is associated with reliable student inferences that the teacher is intrinsically or extrinsically motivated, respectively (Wild et al., 1992; 1997), this study focused on how second generation learners made inferences about the motivation of their (peer) teacher in an unconstrained learning context. Specifically, we investigated how second-generation learners

interpreted their learning session when no explicit cues about their teacher's motives were given. As Hassin, Aarts, and Ferguson (2005) demonstrated, people strive to understand why people act, especially when it comes to significant others, and proposed that people continually scan their environment, spontaneously extracting cues to develop inferences about others' motives. Because second generation learners have no experimenter-provided contextual cues about their teacher's motives, we propose that they will scan the learning environment and spontaneously make inferences about her or his motives from behavioral cues present in their educational encounter.

Hypothesis 3 (H3; processes of motivational contagion): We predicted that different levels of IM toward the task created among first generation learners would spread to second generation learners in the second teaching session through differences in autonomy-supportive teaching style and positive affect. Consistent with the expectancy formation mechanism proposed by Wild et al (1997; Wild & Enzle, 2002), we propose that these behavioral cues would be used by second generation learners to make inferences about first generation learners' motives to teach. If so, autonomy-supportive teaching style and positive affect reported by first generation learners should be positively associated with second generation learners' beliefs that their teacher is intrinsically motivated. In turn, second generation learners' perceptions of their teachers' motivation to engage in the task should influence their own intrinsic motivation for the task. Thus, we predicted that the more second-generation learners infer that their teacher is intrinsically motivated, the more IM for the task they would demonstrate themselves. Figure 1 presents our proposed model specifying these mediational processes linking first and second-generation learners' motivation.

Method

Participants

Ninety-one students were recruited from two French senior high-school classes. Three weeks before the day of the experiment, all participants completed the French version of the Sport Motivation Scale (EMS, Brière, Vallerand, Blais, & Pelletier, 1995) in order to identify their contextual motivation for sport. In order to avoid confounding effects associated with participants' own motivation to engage in sport activities, students who had the most extreme scores on self-determined motivation (i.e., ± 1 *SD*) were not run through the procedure. Thus, 72 students (28 females and 44 males; *M* age = 18.5 years, *SD* = 0.7), principally white Europeans (97%), were retained to participate in the experiment. They were randomly assigned to two experimental groups (paid or volunteer teaching) of equal size, as described in the following section.

Students' pre-test scores on the EMS¹ showed that self-determined motivation for engaging in sport activities prior to participating in the study was similar across experimental conditions (*Ms* = 7.63 and 7.77, *t* = 0.13, *p* = .89 in the paid and volunteer conditions, respectively). In each experimental group, participants were randomly assigned to be a first (*N* = 12 in each condition) or a second (*N* = 24 in each condition) generation learner. In order to maximize external validity of the study results, students did not receive an informed consent procedure prior to engaging in the study. It should be noted that the American Psychological Association's Ethical code (Standard 8.05, 2002) authorizes the exemption of informed consent form for this reason and in this context.

Procedure

The study took place on the International Day of Disabled Persons. All information about the teaching and learning session was delivered to students by their regular physical education teacher. First, students were told that a special teaching session on sport for disabled persons was going to be presented by a guest instructor during their regular physical education class, in order to raise awareness about people living with handicaps. Students were informed that the session would be video-recorded in order to provide a record of this event for the school. While some participants (first generation learners) received their lesson from the instructor in a first teaching session, other participants (second-generation learners) received the lesson from first generation learners via a peer-tutoring interaction.

First teaching session. A total of 24 first generation learners were instructed in a sport activity designed for blind teenagers. This teaching session took place in a school gymnasium, in groups of six. Before the arrival of the guest instructor, the physical education teacher asked students to pay close attention in order to introduce the instructor to the group. Following the Wild et al. (1992, 1997) procedure, the external instructor was described to first generation learners in the *volunteer condition* as “a voluntary worker from a non profit association for blind teenagers. He was very motivated to introduce students without disability to a sport activity practiced by blind teenagers. He contacted the school to introduce you to this activity free of charge for 20 minutes.” In the *paid condition*, the instructor was described as “a professional worker from an institute for blind teenagers. Our school contacted him to introduce you to a sport activity practiced by blind teenagers. It was difficult to convince him and he wanted to remain only 20 minutes and asked to receive a high amount of pay to teach you this lesson.” In each condition, the physical education teacher asked one student to repeat what he had just said.

Next, the instructor entered the gymnasium and gave the lesson. In reality, he was an experienced physical education teacher, specialized in sports for disabled people. The confederate instructor was blinded to conditions and delivered a standardized lesson following a script (cf. Wild et al., 1992; 1997). He was asked to strictly follow the script in order to maximize the similarity of the lessons for every learning group. The relatively dense content of the lesson constrained interactions between the instructor and the first generation learners. We believed that reliance on a standardized script and a lack of opportunity to interact with the instructor could be experienced by students as controlling, and so some autonomy supportive elements were included in order to provide a neutral instructional style across conditions. Thus, in both experimental conditions, the confederate instructor provided the same standardized rationale for the activity and the learning tasks, and delivered empathic statements to the whole group. Goalball – a sport designed for blind people – was selected as the learning activity because pilot testing revealed that none of the high school students already knew this activity. This game consists of throwing a ball into an opponent's goal to score. Bells are embedded into the ball in order for blind people to judge position and movement of the ball in order to catch it. Tactile marks are laid down on the floor to help players to situate themselves on the playing area. The lesson included a brief description of the activity and its rules (3 min), five learning tasks (14 min) and a period of real playing in a 1 on 1 format, with first generation learners wearing a blindfold (3 min). After 20 minutes, the physical education teacher stopped the lesson and accompanied the confederate instructor out of the gymnasium.

Second teaching session. Next, the physical education teacher asked first generation learners to teach two others students the same activity that they just learned. Each teacher was yoked to two same sex students within the sample of 48 second-generation learners. No specific

advice or instruction was provided regarding how or what to teach. First generation learners went to a separate part of the gymnasium, where a Goalball game-area was set. All peer education interactions were videotaped using a fixed wide-angle camcorder, and each teacher was equipped with a wireless lapel-mounted microphone. Twelve minutes later, the physical education teacher came back to announce the end of the session. He said that the lesson was over and that he would be back soon to assess their thoughts and feelings related to the activity by administering a questionnaire. All learners were then left alone in the gymnasium for a 10-min free-choice interval, during which time they were told that they could (a) continue to play Goalball, (b) play another activity such as basketball (equipment was available in the gymnasium), or (c) do nothing and wait for the return of the physical education teacher. This free-play period was video-recorded as well.

After the free-choice interval, the physical education teacher re-entered the gymnasium and administered the post-experimental questionnaire. The first generation learners' questionnaire assessed their IM for the activity as well as affective reactions during their teaching session. The second-generation learners' questionnaire assessed their IM for the activity and their perceptions of their teacher's motivation to teach the activity. Finally, participants were thanked and debriefed. A debriefing about the study purposes and hypotheses was provided to all students in the next scheduled physical education class.

Measures

Contextual motivation for sport. The French version of the Sport Motivation Scale (SMS; Pelletier, Vallerand, Fortier, Tuson, Brière, & Blais, 1995), i.e., "*L'Échelle de Motivation dans les Sports*" (EMS; Brière, Vallerand, Blais & Pelletier, 1995) was used to establish equivalence of participants' sport motivation across conditions prior to the study. This instrument asks

participants a general question (“Why do you practice sport”), which is followed by 28 items assessing amotivation (e.g., “I often ask myself; I can't seem to achieve the goals that I set for myself.”), three types of extrinsic motivation: external (e.g., “Because it allows me to be well regarded by people that I know”), introjected (e.g., “Because I would feel bad if I was not taking the time to do it”) and identified regulation (e.g., “Because it is a good way to learn lots of things which could be useful to me in other areas of my life”), and three types of IM: to experience stimulation (e.g., “For the excitement I feel when I am really involved in the activity”), to know (e.g., “For the pleasure it gives me to know more about the sport that I practice”) and toward accomplishments (e.g., “For the pleasure I feel while improving some of my weak points”). Responses for each item use a 7-point Likert scale. Recent studies (see Pelletier & Sarrazin, 2007, for a review) have confirmed the validity and the reliability of the scale. Following the example of many previous studies (e.g., Ntoumanis, 2005; Sarrazin, Vallerand, Guillet, Pelletier, & Cury, 2002; Standage et al., 2005) we derived an overall self-determination index for sport by weighting the EMS subscales according to its respective place on the self-determination continuum, multiplying this weight by the score of the subscale, and adding the scores of all subscales, using the following formula: $(2 \times \text{IM} + \text{Identified Regulation}) - [(\text{Introjected Regulation} + \text{External Regulation}) / 2 + 2 \times \text{Amotivation}]$ (see Vallerand, 1997).

Intrinsic motivation for the activity. Self-reported and behavioral measures of IM were used. An 8-item scale from the interest/enjoyment subscale of the Intrinsic Motivation Inventory (McAuley, Duncan, & Tammen, 1989) was given to first and second-generation learners (e.g., “I enjoyed doing this activity very much”). Each item was rated on a 7-point Likert scale ($\alpha = .92$). Time spent by each student playing Goalball during the free-choice period was used as a behavioral measure of intrinsic motivation (Deci, 1971). Time was coded from the recording by

a judge who was blinded to condition. Scores were ranged from 0 to 600 s. A significant positive correlation was found between IM as assessed via self-reported and duration of activity engagement ($r = .47, p < .01$).

Inferences about first-generation motives for teaching. Second-generation learners were asked why their teacher engaged in the educational activity using an adapted version of Pelletier and Vallerand's (1996) scale, which included two subscales. The original scale measured perceptions of others' extrinsic and intrinsic motives for a game. We adapted the items by translating them to French and focusing on the teaching activity. Four items assessed intrinsic motives to teach (e.g., "because he/she found the activity pleasant") and four items described extrinsic motives to teach (e.g., "because he/she felt obliged to do that"). Participants evaluated each item on a 7-point Likert scale. Internal consistency was satisfactory for both adapted subscales ($\alpha = .89$ and $.84$, respectively). Given that both scales were substantially correlated ($r = -.59, p < .001$), perception of intrinsic motives to teach was analyzed relatively to extrinsic ones (by calculating the difference between intrinsic and extrinsic motives for each participant).

Affect experienced during the teaching session. First generation learners filled out the French version of the Positive-Affect-Negative-Affect Scale (PANASf, Gaudreau, Sanchez, & Blondin, 2006). This questionnaire was composed of two subscales: one containing 10 positive affect items (e.g., "enthusiastic"; $\alpha = .83$) and the other one containing 10 negative affect items (e.g., "scared"; $\alpha = .63$). Participants were asked to evaluate to what extent each adjective described how they felt when they had taught the activity using a 5-point Likert scale.

Teaching style displayed in the second teaching session. Using the observational grid developed by Reeve and Jang (2006), two judges, unaware of the purpose of the study and blinded to experimental conditions, independently rated teachers' (i.e., first generation learners)

behaviors when they taught the activity to the second-generation learners. Derived from SDT, this grid identifies 8 autonomy supportive behaviors (i.e., time in second during which listening students, let student talking, and frequency of providing rationale, offering encouragement, providing informational praise, offering hints, asking what the student wants and communicating perspective-taking statements) and 5 controlling behaviors (i.e., time in second during which holding learning materials and frequency of uttering directives, asking controlling questions, revealing solutions and criticizing). Inter-rater reliabilities for these instructional behaviors were acceptable (all intra-class correlations were between .68 and .97). All behavioral scores were transformed to *z*-scores prior to analyses. Given that all aspects of autonomy supportive and controlling behaviors act together to form general impressions of teaching style (Deci, Eghari, Patrick, & Leone, 1994), we derived a global autonomy-supportive style variable from the behavioral ratings using the method reported by Reeve, Nix, and Hamm (2003), wherein controlling behaviors were reverse-scored and added to the autonomy-supportive behaviors.

Results

Inferential and Social Contagion Effects on Intrinsic Motivation

Mean comparison analyses (i.e., *t*-tests) were carried out to test H1 and H2. Specifically, we examined whether experimental groups of first and second generation learners presented statistically significant differences on behavioral and self-reported IM for the target activity after exposure to a supposedly paid or volunteer instructor.

Results shown in Table 1 provide evidence for H1, i.e., the predicted inference effect. Specifically, first generation learners in the volunteer condition reported significantly greater interest/enjoyment and exhibited significantly greater behavioral persistence for the target activity during the free choice period, compared to first generation learners in the paid condition.

Results shown in Table 1 also provide evidence for H2, i.e., the predicted social contagion effect. Thus, second generation learners who were taught by first generation learners in the volunteer condition reported significantly more interest/enjoyment for the activity and exhibited greater behavioral persistence with the target activity during the free-choice period, compared to participants who were taught by first generation learners in the paid condition.

Processes Underlying Social Contagion of Motivation

H3 proposes that social contagion between first and second-generation learners' motivation for the target activity is the result of a causal chain containing several mediators (see Figure 1). A path analysis using structural equation modeling (SEM) examined the fit between our hypothesized mediational sequence and our data. One important consideration for conducting SEM is the ratio of the number of participants per estimated parameter. According to Bentler and Chou (1987), a ratio of 5:1 is considered as a minimum. To achieve this ratio, we deleted several variables prior to conducting our process analysis. First, we did not include first generation learners' self-reported negative affect during their teaching session in the analysis because this variable was not significantly correlated with any other study variables. Second, given the correlation between the behavioral and the self-reported measure of IM ($r = .49, p < .01$), we decided to carry out analyses only with the behavioral measure IM. This decision is consistent with our emphasis in this study on determining whether social contagion effects occur for behavioral measures of IM. Moreover, a behavioral measure of IM is less subject to self-presentation bias, and is consistent with recent recommendations to enhance the use of behavioral variables in social psychology (e.g., Baumeister, Vohs, & Funder 2007). Testing the model displayed in Figure 1 with the remaining study variables required us to calculate 10 parameters. With 48 participants, the ratio of sample size to estimated parameters is just

acceptable. The proposed model was tested with LISREL 8.54 (Jöreskog & Sörbom, 1996) using the correlation matrix of included study variables (see Table 2) and maximum likelihood estimation.

The results revealed that the hypothesized model fit the data relatively well: $\chi^2(5) = 7.74$, $p = .17$, CFI = .95, NNFI = .91, RMSEA = .11. However, examination of the modification indices suggested the addition of a path from autonomy-supportive teaching style of the first generation learners to the second-generation learners' IM for the task. We decided to accept this modification on theoretical and empirical grounds: according to SDT and a large literature (see Reeve et al., 2004), teachers' autonomy-supportive behaviors can directly affect students' IM. After implementing this change model fit improved: $\chi^2(4) = 3.73$, $p = .44$, CFI = 1.00, NNFI = 1.00, RMSEA = .00.

The standardized coefficients are displayed in Figure 2. All estimated parameters were significant ($ts > 2.13$, $ps < .05$). Results indicated that first generation learners' IM significantly predicted how much positive affect they experienced when they taught the activity to peers ($\beta = .58$) and the extent to which their teaching style was autonomy-supportive ($\beta = .57$). In turn, positive affect and autonomy-supportive teaching style of first generation learners predicted second-generation learners' inferences about first generation learners' IM to teach ($\beta = .42$ and $.29$ respectively), which in turn predicted their own IM for the task ($\beta = .30$). Finally, autonomy-supportive teaching style directly predicted second generation learners' IM for the task ($\beta = .30$), and in combination with second generation learners' inferences about their teacher's IM, explained 26 percent of the variance in second generation learners' own IM for the activity.

An additional model was also tested to determine whether social contagion of motivation between first and second-generation learners' IM for the activity was mediated by the three

variables proposed in Figure 1. Amending the model to include a direct path between first and second generation learners' IM did not yield a significant improvement of fit [$\Delta\chi^2(1) = 0.12$, ns], and the path was not significant ($\beta = -.02$, $t = -0.10$). The significant total effect ($\beta = .29$, $Z = 2.09$) of the antecedent variable in Figure 1 (i.e., first generation learners' IM) to the dependent variable (i.e., second generation learners' IM) was decomposed into direct and indirect effects (Mackinnon, Lockwood, Hoffman, West, & Sheets, 2002). As just reported, the direct effect (i.e., a path linking first and second generation learners' IM when mediators are controlled for) was non-significant. However, the indirect effect (i.e., the effect of the 3 proposed meditational variables in that relationship) was significant ($\beta = .30$; $Z = 2.76$). These additional results indicate that the relationship between first and second-generation learners' IM is fully mediated by the hypothesized variables derived from our model.

Discussion

A large literature provides support for the idea that teachers can undermine or support students' interest in learning by engaging in controlling or autonomy supportive behaviors, respectively (e.g., Flink, Boggiano, & Barrett, 1990; Reeve & Jang, 2006; see Niemiec & Ryan, 2009; Ntoumanis & Standage, 2009; Reeve, 2002 for reviews of this literature). Wild et al. (1992) reported that objective differences in teacher behavior are sufficient, but not necessary, to influence students' IM, i.e., the same effects on students' interest in learning can be elicited merely by eliciting differential inferences about the motives of their teacher. Subsequent research showed that this inferential effect could spontaneously spread from teacher to learner in a subsequent educational session (Wild et al., 1997). However, research on these phenomena to date has been limited by reliance on learning tasks implemented in laboratory settings and by a lack of consideration of mediational processes underlying the spread of motivational orientations

across generations of learners. The present study addressed these limitations by examining whether motivational orientation could spread from teachers to students during two consecutive teaching-learning sessions, and tested a model of mechanisms underlying this phenomenon in an experimental field study conducted in French high schools.

As predicted, students exposed to third-party information that their teacher was a volunteer reported more interest and enjoyment in the target activity and demonstrated greater activity duration in a free choice period, compared to students who were exposed to third-party information that their teacher was paid to engage in the lesson. These results were obtained despite the fact that students in both conditions received the same standardized, instructor-centered lesson that included both controlling and autonomy supportive elements. These results conceptually replicate the inferential effects on IM for learning observed in previous work (Wild et al., 1992; 1997). Although not the focus of the present study, these first-generation learning results can be interpreted using the social contagion of motivation model (Wild & Enzle, 2002). Thus, we can speculate that exposure to third-party information provided about the voluntary versus paid status of an instructor generated inferences about their teacher's IM versus EM for instruction. In turn, these inferences about the instructor's motives generated expectancies about quality of task engagement, autonomy support, and relatedness, which in turn influenced first generation students' own IM for the activity. Future research should examine whether these expectancies did in fact mediate the observed first-generation learning results obtained in this study. Also as predicted, second generation learners who were taught by first generation learners in the volunteer condition *also* reported more interest/enjoyment in the target activity and persisted more in a free choice period, compared to second generation learners who were taught

by first generation learners in the paid condition. These findings confirm that motivational orientation toward learning can spread during unconstrained peer tutoring (Wild et al., 1997).

The present study also extended previous research on social contagion of motivation, through a process analysis of how first and second generation learners interacted in a second, unconstrained, teaching session. Results were consistent with our model linking first and second-generation students' motivation toward the activity. As predicted, we found that first generation learners who were exhibited more IM for the activity adopted a more autonomy supportive teaching style and reported experiencing more positive affect when they changed roles and taught a new learner, compared to first generation learners who exhibited less IM for the activity. These findings are consistent with other research showing that IM is associated with positive consequences such as positive affect (e.g., Standage et al., 2005) and that teachers who report high levels of self-determined motivation for teaching are perceived by learners as more autonomy supportive (Pelletier et al., 2002). Of particular interest, we found that autonomy supportiveness and positive affects experienced during second generation teaching were not correlated ($r = .21, p > .16$), suggesting that there may be two distinct sources of behavioral cues that influence second generation learners' IM for activities.

These differential teaching behaviors and affects constituted the basis of the theorized mediational sequence linking social contagion of IM across first and second-generation learners. Thus, as predicted, we found that autonomy supportive teaching style and positive affect experienced by first generation teachers were positively associated with second-generation learners' inferences about their teacher's IM (relative to extrinsic motivation). In turn, perceptions of the teacher's IM affected second generation learners' involvement in the activity: the more learners felt that their classmate taught them for intrinsic (relative to extrinsic) reasons,

the greater their own IM for the activity was. One unanticipated finding was that inclusion of a direct effect of first-generation teachers' autonomy supportiveness during peer tutoring on second generation learners' IM improved the fit of our theoretical model (see Figure 2). This finding is consistent with a large body of evidence showing that autonomy supportive teaching styles directly enhances students' IM for learning (see Reeve, 2002, Reeve et al., 2004, for reviews).

In confirming previous findings about inferential and contagion effects on IM for learning, the present study demonstrated that these effects can be observed in an educational field setting (i.e., among high school students receiving physical education instruction during regularly scheduled class time, using group instruction and peer tutoring techniques). Exposure to third-party information about an instructor's reasons for engaging in an educational encounter influenced two generations of learners' IM toward learning the activity. From a theoretical perspective, our results are consistent with the notion that learners are sensitive to interpersonal cues that are informative with respect to making inferences about their teacher's motives for engaging in instruction. Although this process of making inferences might appear to demand many cognitive resources, Hassin et al (2005) demonstrated that individuals spontaneously interpret other's motives. If so, the motivational contagion effect demonstrated in this study may be an important, but under-appreciated influence on quality of learning in routine educational contexts in which no explicit cues about teachers' motives are particularly salient.

From an applied perspective, we suggest that these findings may be relevant for any educational interaction where cues about a teacher's motives for engaging in instruction are available to students. If so, educators could draw on the present results to enhance students' IM for learning. For example, explicitly expressing interest and satisfaction for teaching an activity,

expressing positive affects instead of being emotionally reserved, explicitly mentioning intrinsic instead of extrinsic reasons to engage in instruction are techniques that could be used to create a class environment in which positive contagion of IM for learning could be fostered. The present results imply that cues related to teachers' displays of positive affect and autonomy supportiveness provide contextual cues that can positively influence motivational orientations of students. As such, our results might help inform educators that quality of students' IM for learning is influenced not only by their activities (e.g., how autonomy supportive they are in the classroom), but also by their own motivations for instruction through student inferences of their motives. In addition, teachers should be particularly aware of their unintentional motivational influence because the displayed motivation can potentially share across students.

Limitations and Future Research

Several study limitations should be acknowledged when interpreting the present findings. First, we did not perform a manipulation check to verify that our experimental manipulation resulted in perceptions among first-generation learners that the confederate instructor was intrinsically or extrinsically motivated in the volunteer versus paid conditions, respectively. Although previous studies have confirmed that exposure to such third-party information elicits reliable perceptions of interpersonal targets' IM or EM for engaging in an activity, (Wild et al., 1992; 1997), those findings were obtained in a laboratory setting. Additional research is therefore required to (a) confirm that exposure to an ostensibly volunteer or paid teacher elicits first-generation learners' perceptions that their instructor is intrinsically versus extrinsically motivated for engaging in a lesson, respectively, and to (b) determine whether other reactions to third party information about a teacher's motives (e.g., mistrust) could initiate the motivational contagion effect observed in this study.

Additional study limitations relate to the timing of some of the measures used in the present research, as well as the relatively low sample size used in the study. For example, the effects we observed on first-generation learners' perceptions and IM were assessed at the end of the study procedures. Future research on motivational contagion should assess teacher effects on first generation learners' inferences and motivation for learning and teaching closer to their theorized impact. As well, greater confidence in the observed direct and indirect effects on second-generation learners would be obtained if our SEM results were replicated using larger sample sizes.

Finally, ecological validity of our findings was compromised in several ways that, taken together, reduced generalizability of our findings to educational settings, and to physical education classes specifically. For example, routine classroom instruction does not typically draw students' attention to the paid or voluntary nature of a teacher's activities. Although this limitation does not undermine the contagion effects revealed by our SEM findings, future research should attempt to further clarify conditions under which students make *spontaneous* inferences about their teacher's motives for instruction. Ecological validity was also reduced in the present study because other elements of the lesson were contrived (i.e., a short duration of initial instruction, use of an external instructor rather than students' regular physical education teacher). As well, physical education classes are somewhat different than regular classroom instruction. In addition, teacher-student interactions are less constrained and less instructor-driven in regular classroom contexts than it was the case in our protocol, which raises the possibility that reciprocal effects of students on teachers may be more likely to occur than as demonstrated in this study. To address these limitations, additional field research is required to replicate our results using learning tasks that more closely approximate instructional plans as

routinely used in physical education classes, and in school systems more broadly. In general, further studies are needed to determine boundary conditions for the social contagion effects observed in this line of research. We hope that future research will help clarify these conditions and determine, among other things, whether motivational contagion can extend beyond the learned target activity, how long these inferential and contagion effects occur, and whether moderator variables influence when students may be more or less receptive to these contextual motivational processes.

Conclusion

Self-determination theory has emerged as an influential approach to understanding the conditions that maximize students' intrinsic motivation for learning (Niemiec & Ryan, 2009; Ntoumanis & Standage, 2009; Reeve, 2002). A large body of research using SDT supports the position that autonomy-supportive or controlling instructional styles are important, robust influences on quality of student motivation (e.g., Reeve, Deci, & Ryan, 2004; Reeve & Jang, 2006; Ryan & Deci, 2000). Results from our process model of social contagion of motivation in educational settings confirms the importance of this causal pathway: the more autonomy-supportive first generation learners were in peer tutoring, the more second generation learners' demonstrated IM for the activity. Beyond replicating this well-established finding, the present study draws attention to other, perhaps less obvious influences on quality of students' IM for learning. Specifically, the present results confirm that contextual cues provided about a teacher can have motivational effects on quality of student learning, and that motivational effects can spread from student to student in subsequent peer tutoring. Our first-generation learning results indicate that students' perceptions of their teacher's reasons for instruction can influence IM for learning even when instructional style is standardized. Our second-generation learning results

indicate that student inferences about the motives of their (peer) instructor can influence their IM for learning, even when autonomy-supportive instructional styles are used in unconstrained educational encounters. Taken together, these findings suggest that student inferences about teachers' motives represent an important, but understudied source of influence on students' intrinsic motivation for learning.

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Footnotes

¹ We used the SMS as a control measure of the students' motivation because contextual motivation is considered as a good predictor of situational motivation (Vallerand, 1997). For example, Ntoumanis and Blaymires (2003) showed that contextual motivation for sport assessed with the SMS was an excellent predictor of situational motivation for a specific physical education lesson occurring one month after.

Table 1

Effects of experimental condition on first and second generation learners' intrinsic motivation

	Condition		Student <i>t</i>
	Intrinsic	Extrinsic	
	Motivation	Motivation	
	<i>M (SD)</i>	<i>M (SD)</i>	
1st Generation Learners (<i>N</i> = 24)			
Seconds playing Goalball in the free-choice period	279 (96)	87 (94)	5.06**
Self-reported intrinsic motivation for Goalball	5.42 (0.88)	4.58 (1.07)	2.15*
2nd Generation Learners (<i>N</i> = 48)			
Seconds playing Goalball in the free-choice period	236 (157)	129 (134)	2.54*
Self-reported intrinsic motivation for Goalball	5.34 (0.76)	4.73 (1.12)	2.21*

Notes: ^t $p < .10$; * $p < .05$; ** $p < .01$.

Table 2:

Zero-order correlation between study variables used in the processes analysis.

	1	2	3	4	5
1st generation learners					
1- Seconds playing Goalball in the free-choice period	-				
2- Positive affects during teaching session	.58**	-			
3- Autonomy supportive teaching style	.57**	.21	-		
2nd generation learners					
4- Inferences about 1 st generation learners' intrinsic (versus extrinsic) motivation for teaching	.47**	.48**	.38**	-	
5- Seconds playing Goalball in the free-choice period	.30*	.32*	.42**	.41**	-

*Notes: * $p < .05$; ** $p < .01$.*

Figure Captions

Figure 1: Hypothetical sequence of motivational contagion across the second teaching session

Figure 2: Revised model of contagion from first generation learners' intrinsic motivation to second generation learners' intrinsic motivation.

Notes: The behavioral IM measure (i.e., activity duration during the free choice period) was modeled. All parameters are standardized and significant ($t_s > 2.13$, $p_s < .05$). The dashed line indicates a modification to the original hypothesized model in Figure 1.



