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RUNNING HEAD: teacher expectancy effects in P.E.

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ABSTRACT

The main purpose of this study was to explore the relation between teacher expectations and student achievement in physical education classes, in the light of three complementary hypotheses. Student achievement may confirm teacher expectations because these expectations create self-fulfilling prophecies, create perceptual biases, or accurately predict, without influencing, student achievement (Jussim, 1989). Another purpose was to examine the mediating role played by student perceived ability in the teacher expectancy process. Study data were obtained from 173 students and 7 teachers. Path analysis revealed that teacher expectations have weak self-fulfilling effects, strongly predicted student achievement mainly because they are accurate, and have no biasing effects on teacher judgements. Results also bring evidence concerning the role of partial mediator of student perceived ability in the confirmation process of teacher expectations.

KEY WORDS: teacher expectations, Pygmalion effect, self-fulfilling prophecy, accuracy, physical education.

The Influence of Teacher Expectations on Students Achievement in Physical Education Classes: Pygmalion Revisited

We rarely interact with others without at least some expectancies about how they will act or perform (Miller & Turnbull, 1986). The complex educational relationship does not depart from this rule: teachers develop expectations for the performance and the behaviour of their students early in the year (Brophy, 1983; Brophy & Good, 1974). Expectations can be defined as inferences that teachers make about future behaviour or academic performance of their students, based on what they know about their students (Good, 1987). These cues can be either objective (e.g., past achievement, students motivation) or subjective (e.g., teachers prejudices, stereotypes). Most students confirm these expectations. Numerous researchers (e.g., Alvidrez & Weinstein, 1999; Hoge & Butcher, 1984; Jussim, 1989; for reviews see Brophy, 1983; Jussim, 1991; Jussim, Smith, Madon & Palumbo, 1998) revealed strong correlation between teacher expectations and student achievement. In other words, the higher the teacher expectations were for a student, the higher was the student achievement. Meanwhile, a strong correlation between teacher expectations and student achievement does not inevitably express a causal link. Indeed, in its "Reflection-Construction" model, Jussim (1991) suggests three alternative hypotheses which explain the relations between the expectations of the teacher regarding particular students and those students attributes and behaviours: teacher expectations can be confirmed because they lead to self-fulfilling prophecies, to perceptual biases or because they are accurate. Figure 1 presents an adapted version of this conceptual model, constituting the framework of this study.

Insert Figure 1 here

Self-fulfilling prophecy

The first hypothesis evolves from a strong social constructivist perspective. It predicts that teacher beliefs about students will transform their behaviours in ways that confirm the initial expectations; this is the concept of the self-fulfilling prophecy or Pygmalion effect (Brophy, 1983; Jussim, 1986; Merton, 1948; Olson, Roese, & Zanna, 1996; Rosenthal, 1974). Researchers have studied the self-fulfilling effects from expectancies in and out the laboratory (see reviews by Jussim, 1986, 1991; Jussim & Eccles, 1995; Snyder, 1984). The self-fulfilling prophecy has been widely explored in classroom settings (Brophy, 1983; Jussim, 1986). Applied to classrooms, the self-fulfilling prophecy refers to situations in which teacher expectations causes the student performance to be consistent with the expectations of the teacher.

Several theoretical models tried to explain the Pygmalion Effect (e.g., Brophy & Good, 1974; Cooper & Good, 1983; Darley & Fazio, 1980; Jussim, 1986; Martinek, 1981; Rosenthal, 1974). These models usually consist of three stages: (1) teachers develop expectations for students future achievement, (2) they treat students differently (qualitatively and quantitatively) according to these expectations, and (3) this differential treatment influences directly, or indirectly via motivational and cognitive variables (e.g., student self-perceptions) the students achievement. This hypothesis is symbolised by thick lines in Figure 1 (paths 2, 3a and 3b).

Under naturalistic conditions, the occurrence of a self-fulfilling prophecy is likely when the teacher early expectations predict students future achievement, even after controlling for variables which may have an impact on students achievement (e.g.,

student prior achievement and self-perception). Indeed, teacher expectations have to "change" students behaviour if we want to interpret the expectation-behaviour association as evidence of the existence of self-fulfilling prophecy (Jussim, 1989).

Perceptual biases

Another hypothesis assumes that expectancy confirmation doesn't arise in the student actual behaviour but only in the teacher mind (Darley & Fazio, 1980; Jussim, 1991; Miller & Turnbull, 1986). Expectations may serve as perceptual and interpretative filters leading to biases (Smith, Neuberg, Judice, & Biesanz, 1997; Fiedler, 2000; Fiske & Neuberg, 1990; Hamilton, Sherman, & Ruvolo, 1990; Higgins & Bargh, 1987). Teachers may interpret, remember, and/or explain students behaviour in ways consistent with their expectations. In other words, teachers judgement of students achievement (i.e., grades) may be biased by their expectations (Jussim, 1989).

According to the perceptual bias hypothesis, teacher expectations predict their own judgements of student achievement (i.e., grades) more than independent assessments of achievement (i.e., standardised test scores) (Jussim, 1989, 1991). Thus, teacher expectations may predict grades even when controlling for student achievement because these lead to biased evaluations of student achievement, and not because they have influenced student achievement (Darley & Fazio, 1980; Jussim, 1986; Miller & Turnbull, 1986). This hypothesis is represented by an arrow with double lines in Figure 1 (path 4).

Self-fulfilling prophecies and perceptual biases both explain how teacher expectations create the social reality. But expectations may also reflect or predict social reality without influencing either student behaviour or perceptions of that behaviour.

Accurate expectation

Several researchers (e.g., Brophy, 1983; Higgins & Bargh, 1987; Judd & Park, 1993; Jussim, 1989, 1991; Jussim & Eccles, 1992; Madon, Jussim, & Eccles, 1997) have criticised the strong social constructivist's version which assumes that student achievement is "constructed" (or created) by interpersonal interaction. Moreover, self-fulfilling prophecies and perceptual biases have often shown up in experimental setting where erroneous expectations were induced by experimenters (e.g., Rosenthal & Jacobson, 1968; see Harris & Rosenthal, 1985; Raudenbush, 1984, for meta-analyses; Jussim, 1986, 1991, for reviews). Attempts to replicate these studies in natural settings often fail to support the expectation theory (e.g., Brophy, 1983; Meyer, 1985; Raudenbush, 1984; West & Anderson, 1976). For example, Raudenbush (1984) showed that when teachers knew their students for at least 2 weeks, induced erroneous expectations had little influence. Thus, in naturalistic educational setting, the teacher can base his expectations on valid information and predict without influencing student achievement. For example, teachers may locate students who are motivated and possess strong initial abilities. These indicators cause teachers to make accurate predictions of student future achievement. Consequently, the third hypothesis of Jussim (1989, 1991) is that teacher expectations are confirmed not because they created student achievement, but simply because teachers are competent in "predicting without influencing" student achievement. In other words, teacher expectations may accurately "reflect" student achievement. This hypothesis is symbolised by dotted lines in Figure 1.

There are three conceptually separable aspects of accuracy (Jussim, 1991): impression accuracy, predictive accuracy, and judgement accuracy. Impression accuracy concerns the base of teacher expectations. Teacher expectations based on a more valid information can be considered more accurate than those based on a less valid

information (Brophy, 1983; Jussim, 1989; West & Anderson, 1976). For example, expectations based on an information which predicts student final performance (e.g., standardised test scores, motivation) are more accurate than those based on an information which is not connected to the final performance. Paths 1a, 1b, 1c and 1d[1] symbolise this hypothesis, on the Figure 1. However, even expectations based on valid information sometimes inaccurately predict future behaviour (Kahneman & Tversky, 1973). Consequently, predictive accuracy – i.e., how much teacher expectations predict students achievement without causing it – is a second aspect of accuracy. Path 2 symbolises this hypothesis, on the Figure 1. There are both thick and dotted lines because accuracy and the self-fulfilling prophecy effects are perfectly inversely correlated – greater accuracy, less potential for self-fulfilling prophecy (Jussim, 1991). Thus, the second aspect of accuracy involves determining to what extent expectations predict a student performance without causing it. Actually, the zero-order correlation between teacher expectations and student achievement reflect the overall predictive validity of teacher expectations, including expectancy effects (influences of teacher expectations on student achievement, after controlling variables which may have an impact on student achievement) plus predictive accuracy (teachers basing their expectations on factors that influence student achievement). Thus, the difference between the zero-order correlation (i.e., self-fulfilling prophecy and accuracy) and path coefficient (i.e., self-fulfilling prophecy) relating teacher expectations to student achievement is an index of the extent to which teacher expectations predicted, without influencing, student achievement (see Jussim, 1989, 1991; Jussim, Eccles & Madon, 1996, for more detailed explanations). Previous works in naturalistic educational settings (e.g., Jussim, 1989; Jussim & Eccles, 1992) showed that the main part (i.e., 70-

80%) of the correlation between teacher expectations and student achievement is due to teacher accuracy. The third aspect of accuracy involves determining the extent to which the grades teachers assign to students are based on students performance on tests and motivation (e.g., perceived ability) – i.e., judgement accuracy. On the Figure 1, the size of paths 5a and 5b represent the extent to which the students grades are the true reflection of their performance and attitude.

This study

The purposes of this research were (1) to revisit the Pygmalion effect in the light of three hypotheses in physical education classes, and thus to assess the extent to which naturally occurring teacher expectations create self-fulfilling prophecies, create perceptual biases, or accurately predict student achievement, and (2) to explore the role of student self-perception in teacher expectation confirmation process.

Self-fulfilling prophecy, perceptual biases, and accuracy constitute three alternative and complementary (i.e., not mutually exclusive) hypotheses that explain relations between teacher expectations and student achievement (Jussim, 1989, 1991). Because these three hypothesis are conceptualised as quantitative rather than qualitative phenomena, the reflection-construction model (Jussim, 1991) shows that any combination of these three hypothesis may characterise social interaction. Social psychology research, nevertheless, has focused on the self-fulfilling prophecy and perceptual biases, and often ignored accuracy (Darley & Fazio, 1980; Jones, 1986; Miller & Turnbull, 1986; Snyder, 1984). Indeed, previous studies were essentially experimental and involved the induction of false expectations. One of the criticisms levelled again experimental studies of expectancies effects, is that researchers induce

teachers to adopt false expectations by misleading or lying to them. Thus, the relevance of these studies to naturally occurring situations is unclear. Actually, experiments showing that the intentional induction of erroneous expectations leads to biases and self-fulfilling prophecies provide little information about the extent to which natural expectations create social reality. Furthermore, even when such experiments provide evidence of self-fulfilling prophecies, they leave as an open, unanswered, empirical question the extent to which naturally developed teacher expectations predict student achievement because they are accurate (Jussim *et al.*, 1998).

In the same way the Jussim and collaborators' studies (e.g., Jussim, 1989; Jussim & Eccles, 1992; Jussim *et al.*, 1996), this one was done in a naturalistic context, in order to bring some interesting information about the extent to which naturally occurring teacher expectations influence or reflect students achievement and attributes. Nevertheless, the model tested in this study is different from those used in prior naturalistic studies of Jussim and collaborators. Indeed, because final performances were usually assessed after final grades were assigned, previous studies didn't consider the possible effect of student final performance on teacher evaluation (paths 5a, b in Figure 1). In the present study, final performance were assessed before final grades, so the effect of final performance on final grades can be explored. Consequently, contrary to the former studies (Jussim, 1989; Jussim & Eccles, 1992; West & Anderson, 1976), this study allows the possibility to test the three types of teacher accuracy described above. Furthermore, former Jussim's works tested the different stages of the model in several analyses (e.g., base of teacher expectations; predictors of student achievement). This strategy can entail some loss of the perspective that is provided by seeing the entire sequence unfolding (Kelley, 1992). The present study uses structural equation

modelling in order to test all the steps of the expectancy confirmation process in a single path analysis model. Thus, it may explore a more real and a more global picture of the relations between teacher expectations and student achievement. Finally, this study tests the reflect-construction model in a different situation from those studied by Jussim and collaborators: physical education classes. Some research in this domain supports the notion that teacher expectations may affect student outcomes such as self-concept, motivation, and performance (e.g., Cousineau & Luke, 1990; Martel, Gagnon, Pelletier-Murphy, & Grenier, 1999; Martinek, 1981, 1988, 1989; Martinek & Karper, 1984; Morency, 1990). These studies, however, have focused on the self-fulfilling prophecy and have ignored the accuracy and perceptual biases of teachers. One can however suppose that physical education classes may be a context more favourable than others to accuracy. Indeed, compared to teachers of other disciplines (e.g., mathematics, reading), physical education teachers see their students in action more often. Consequently, opportunities abound to have a very good picture of student overall athletic abilities very quickly insofar as teachers may base their perceptions on presumably valid and/or readily observable information. So, teachers may have numerous opportunities to adapt or revise their expectations because students can demonstrate their competence many times over the course of the school year. Thus, the physical educational situation is probably particularly suited to demonstrating accuracy effects, and perhaps has weaker bias and self-fulfilling effects than other academic situations.

Another purpose was to explore the underlying processes of self-fulfilling prophecies with emphasis on student self-perception of ability. As underlined above teacher expectations effects are also assumed to be mediated by cognitive factors such as student self-concepts. In other words, teacher expectations, by leading to differential

treatment in the classroom may affect student self-perceptions and motivation, and in turn their achievement (Brophy, 1983; Jussim, 1986). In order to examine the role played by student self-perception in expectancy effects, this study focused on perceived ability. Numerous researchers in academic (e.g., Bandura, 1986; Eccles & Wigfield, 1985; Harter, 1985; Nicholls, 1989; Pintrich & Schunk, 1996) and sport (see reviews by, Brustad, Babkes & Smith, 2000; Roberts, 2001) domains showed that perceived ability is a principal determinant of motivational dynamic, underlying achievement endeavour, provided effort and persistence after failure. The shaping of student perceived ability through self-fulfilling prophecies is well-documented. Several researches showed that teacher expectations early in the year predicted student self-concept of ability (e.g., Bibik, 1999; Jussim, 1989; Jussim & Eccles, 1992; Madon, Smith, Jussim, Russell, Eccles, Palumbo, & Walkiewicz, 2001; Parsons, Kaczala, & Meece, 1982; see Eccles & Wigfield, 1985, for a review) and student own performance expectations late in the year (Brattesani, Weinstein, & Marshall, 1984). Thus, the second purpose of this study is to assess the extent to which teacher expectations influence student perceived ability and in turn their final performance, in physical education classes.

Method

Sample

Participants of this study were 173 students (93 boys and 80 girls; M age = 14.37 years, SD = 1.87) and 7 teachers (M age = 38.42 years, SD = 6.69) from 8th to 11th grade in six French Junior high schools. The student sample was largely white (85%) and heterogeneous in socio-economic status. Teachers had a teaching experience

ranging from 7 to 30 years (M experience = 17.67 years, SD = 4.95).

Procedure

This study was conducted over a 10 week period. The content consisted of 10 swimming lessons in physical education classes. The procedure used in this study can be described in three steps. (1) During the first swimming lesson, students responded to a questionnaire assessing their initial perceived ability in swimming. In addition, students completed a standardised test as an initial assessment of their achievement. These measures were done by the experimenter in another pool than the one used for the lessons. This was done so teachers weren't aware of the student performances. (2) After the first lesson, teachers responded to a questionnaire assessing their expectations for each student's swimming ability and talent in the swimming session. (3) During the last lesson, students responded to a questionnaire assessing their final perceived ability. A standardised test was completed again by each student to assess their final achievement. Additionally, student grades on these 10-swimming lessons were collected.

Measures

Teacher expectations. Teachers evaluated each student in their class on two expectations: student performance (i.e., "according to you, how good will this student be in swimming ?") and talent (i.e., "does this student have a natural talent which will enable him/her to succeed in swimming?"). Teachers rated items on a 7-point scale ranging from 1 (very bad) to 7 (very good). As these two items were strongly correlated (r = .73), they were reduced to one single dimension.

Perceived ability. Perceived ability is defined as the individual's perception of her/his current competence at swimming activity (Wigfield & Eccles, 2000). To assess perceived swimming ability, a 4-item questionnaire similar to the one developed by

Nicholls and colleagues (Duda & Nicholls, 1992; Nicholls, Cheung, Lauer, & Patashnick, 1989), was used (e.g., "when you're swimming, you consider yourself ..."). Responses were indicated on 7-point scales anchored by very bad (1) and very good (7). In previous research conducted on teenagers, this questionnaire had shown good construct validity, internal consistency, and predictive validity (e.g., Cury, Biddle, Sarrazin & Famose, 1997; Sarrazin, Roberts, Cury, Biddle & Famose, in press). In this study, this scale possessed an adequate internal consistency at the beginning and at the end of the session (α = .70 and .75, respectively). The mean of the responses was calculated and considered as an indication of perceived ability in swimming.

Student achievement. Two measures of prior achievement were used: (1) prior grades in physical education during the school year, and (2) scores on a standardised achievement test taken in the first week of the physical education classes. This test requires the student to swim as far as possible in 10 minutes, and was used as a measure of swimming ability (Refuggi & Chifflet, 1998). There were also two measures of final achievement: (1) scores on the same standardised test taken in the last week of the session, and (2) final grades at the end of the 10-week session.

Data Analysis

Nonindependence of Teacher Expectations. Class membership and between-classroom effects was sometimes ignored in prior studies. Some investigators combined K teachers and N students into a single and undifferentiated group. Such a procedure can either overestimate or underestimate the expectation / achievement relationship. For example, one might obtain a significant correlation when based on a single and undifferentiated group of N students, whereas when computed for each of the K classes separately, the correlation might be zero (Hoge & Coladarci, 1989). To address these

concerns, this study incorporated class membership and between-classroom differences into statistical analyses. Thus, in order to eliminate between-classroom differences, all correlations were rendered independent from classrooms with the following procedures. First, we created a dummy variable for each classroom. Second, we used these dummy coded classrooms variables to predict all the variables used in this study (i.e., teacher expectations, student initial and final grades, scores, and perceived ability). Third, we saved the residuals from these analyses and used them as input data in all of the analyses that we performed. Thus, all analyses included classroom (coded as dummy variables) as predictors of all variables, thereby removing the basic nonindependence between classrooms (for more information about this procedure, see Madon *et al.*, 1997; Madon, Jussim, Keiper, Eccles, Smith & Palumbo, 1998).

Statistical Analysis. Path models were used to evaluate relationships among the variables (i.e., teacher expectations, student achievement and perceived ability) in accordance with the hypothetical model (Figure 1). The model was estimated and tested using the LISREL 8.30 program (Jöreskog & Sörbom, 1999) using product-moment correlation matrix and maximum likelihood estimation procedure. Current views of "goodness of fit" measures, recommended using multiple indices (Bollen, 1989). Based on the suggestions made by several researchers (Bentler, 1990; Bollen & Long, 1993), goodness of fit was evaluated using five methods : (a) chi-square distribution under the null hypothesis, (b) normal fit index (NFI; Bentler & Bonett, 1980), (c) comparative fit index (CFI; Bentler, 1990), (d) adjusted-goodness-of-fit index (AGFI; Joreskog & Sorbom, 1999) and (e) root mean square residual (RMSR).

Results and discussion

Insert Table 1 here

The correlations among the variables assessed in this study are presented in Table 1[2]. The results of this study involved 6 variables and 10 paths. Path analyses from the standardised solution under maximum likelihood are displayed in Figure 2. Coefficients paths are shown only when they were significant at .05. The model exhibited a very good fit to the data: χ^2 (4) = 8.17, $p > .05$, NFI = .99, CFI = .99, AGFI = .92, RMSR = .02.

Insert Figure 2 here

The results confirmed the existence of a significant link (in terms of zero-order correlation) between teacher expectations and student achievement (see Table 1). Teacher expectations are significantly correlated with final standardised test score ($r = .79$, $p < .001$) and with final marks ($r = .65$, $p < .001$). These results confirm previous studies (e.g., Alexander, Entwisle, and Dauber, 1993; Hoge & Butcher, 1984; Jussim, 1989; Jussim & Eccles, 1992) and indicate that the higher teacher expectations are for students, the higher is student achievement. Nevertheless, zero-order correlations do not prove causation and do not differentiate the three potential sources of expectations confirmation. Thus, the results of this study are presented and discussed in three sections: the results relating to (a) the self-fulfilling prophecy hypothesis, (b) the perceptual bias hypothesis, and (c) the accuracy hypothesis.

Self-fulfilling prophecies hypothesis

Direct influence of teacher expectations on student achievement. If teacher expectations are self-fulfilling, they should predict changes in student achievement even after controlling relevant antecedents. The first analyses identified the extent to which

teacher expectations predicted student achievement after controlling for previous achievement and perceived ability. Results show that teacher expectations of student achievement predicted final standardised test scores (β = 0.28). Thus, even when previous achievement and perceived ability were similar, high-expectancy students achieved higher standardised tests scores than did low-expectancy students. These results are consistent with previous studies in classroom settings (e.g., Jussim, 1989; Jussim & Eccles, 1992).

Direct influence of teacher expectations on student perceived ability. Path analyses also show that teacher expectations of student achievement have a significant effect on student perceived ability (β = 0.33), even after controlling for prior perceived ability. In other words, students perceived by teachers as performing well at the beginning of ten swimming lessons regarded themselves as good performers at the end of these lessons. These results are in agreement with studies carried out in physical education (Bibik, 1999) and in other classes (Jussim, 1989; Jussim & Eccles, 1992; Madon *et al.*, 2001; Parsons *et al.,* 1982) showing that teacher expectations early in the year predicted student self-concept of ability late in the year.

Mediating role played by student perceived ability in self-fulfilling prophecy. The results of this study bring a little evidence that students perceived ability mediated self-fulfilling prophecies. Path analysis showed that final student perceived ability marginally predicted final performance (β = 0.08; p = .08). Moreover, because the self-fulfilling effect of teacher expectations on student perceived ability was only 0.33, the indirect effect of teacher expectations on students achievement was marginally significant and small (β = 0.03; p < .10)[3]. Thus, this study weakly supports perspectives proposing that student perceived ability mediates self-fulfilling prophecies (Brattesani *et*

al., 1984; Eccles & Wigfield, 1985; Jussim, 1986)[4].

Perceptual biases hypothesis

According to the perceptual biases hypothesis, teacher expectations should predict student achievement (i.e., grades) more than they predict independent assessments of achievement (standardised test scores) (Jussim & Eccles, 1992). The results of path analysis revealed that teacher expectations of student ability predicted standardised test scores ($\beta = 0.28$) more strongly than final grades ($\beta = 0.07$, ns). Thus, in this study, teacher expectations didn't have biasing effects. Therefore, the results don't support our original hypothesis, and are inconsistent with previous studies done in mathematics (Jussim, 1989; Jussim & Eccles, 1992).

Accuracy hypothesis

This study explored three ways to describe the accuracy of teacher expectations.

Bases of teacher expectations. First, teacher expectations of student achievement can be largely based on valid indicators of student achievement. For this, it is necessary to identify variables from which teachers based their expectations. Results from path analysis show that teacher expectations of student achievement are mainly based on one indicator: initial score on the standardised tests ($\beta = 0.70$). This one predicted 58% of the teacher expectation variance. Thus, teacher expectations were high in impression accuracy because they were strongly linked to a appropriate criterion – i.e., a variable which was a very good predictor of final scores ($\beta = 0.61$).

Predictive accuracy. The second aspect of accuracy concerns the extent to which teacher expectations predicted without influencing student achievement. One index of accuracy is the difference between the zero-order correlation and path coefficients relating teacher expectations to student achievement (Jussim, 1989, 1991; Jussim *et al.*,

1996). In this study, correlation between teacher expectations and student final test score are .79; the path models analyses, which controlled for potential sources of accuracy, reduced this correlation to a path coefficient of 0.28 (compare the correlation from Table 1 with the path coefficient in Fig. 2). The correlation of teacher expectations with student final standardised test scores were reduced by about 65% (when relevant variables are controlled). This means that about 65% of the correlation between teacher expectations and student achievement are predictive without influence (accuracy), and about 35% may represent expectancy effects (self-fulfilling prophecy).

Base of student grade. This third aspect of accuracy represents the extent to which teacher judgements (i.e., final grades) are based on student behaviour (i.e., score on standardised test and perceived ability). Applied to our model, a high value for paths 5a and 5b represents accuracy in teacher judgements of students. Results show that student final grades are to a large extent based on final scores ($\beta = 0.64$) and to a lesser extent on student perceived ability ($\beta = 0.12$). These predicted 60% of the teacher judgements variance. In other words, the grades teacher assigned to students were relatively accurate.

Conclusion

The main purpose of this study was to explore the relation between teachers expectations and student achievement in physical education classes during a 10-week session, in light of three complementary hypothesis described by the reflection-construction model (Jussim, 1991). This study is to our knowledge, the first to test in a full model, the three hypothesis of the confirmation of teacher expectations. In that way, this study provides a more general picture of the complex relations between teacher

expectations and student achievement. Results showed that 2 out of 3 potential sources of teacher expectation confirmation occur in a naturalistic physical education setting.

First of all, these results provide support for the hypothesis that naturally formed teacher expectations are mainly accurate. According to Jussim's works (1989; Jussim & Eccles, 1992) it was found that (1) the main part (i.e., 58%) of the teacher expectation variance were based on a pertinent indicator (i.e., student prior achievement) of student final achievement; and (2) 65% of expectancy prediction was accurate, and has no self-fulfilling effects. Moreover, for the first time a third aspect of teacher accuracy was investigated: the extent to which student final grades were based on student performance and involvement (i.e., judgement accuracy). Results show that 60% of the variance in the grades that teachers assign to students depend on student performance and perceived ability. This study, therefore, supports the consensus emerging from educational research that teacher expectations generally predict student achievement mainly because they are accurate and not because they are self-prophetic (e. g., Brophy, 1983; Jussim, 1989; Jussim *et al.*, 1996, 1998; Meyer, 1985; West & Anderson, 1976). Thus, physical education setting, and more generally educational situation seem to be particularly conducive to accuracy, in comparison with other contexts in which expectations effects have been studied, such as social interaction between previously unacquainted individuals (Snyder & Stukas, 1999). More precisely, due to the numerous interactions between teacher and student, physical education teachers can portray a very good picture of student overall athletic ability very quickly.

Some results, nevertheless, were consistent with the occurrence of self-fulfilling prophecies. Direct effects of teacher expectations on student perceived ability and achievement can be suspected because, even after controlling for relevant

antecedents (student initial perceived ability, prior achievement), teacher expectations had a direct influence on students outcomes. The results are consistent with previous studies in physical education classes (e.g., Bibik, 1999; Martinek, 1981, 1988, 1989; Martinek & Karper, 1984) and in mathematics classes (Jussim, 1989; Jussim & Eccles, 1992). Some expectancy effects may lead directly to differences in cognitive and ability development without much mediation by motivational processes. For example, teachers may devote more time and attention to high-expectancy students (Jussim, 1986, Martinek & Karper, 1986; Rosenthal, 1974). This effect, however, is relatively limited ($\beta = 0.28$), but consistent with the effect sizes of between .10 and .30 obtained in prior works on expectancy effects under naturalistic conditions (Brophy, 1983; Brophy & Good, 1974; Jussim, 1989; Jussim & Eccles, 1995b; Raudenbush, 1984). Nevertheless, the relatively restricted duration (10 weeks) of the session studied may constitute a limiting factor for assessing the self-fulfilling prophecy effect. The influence of differential treatment seems to be a relatively long process to set up. More longitudinal studies (e.g., for one school year) would allow for a more significant effect of self-fulfilling prophecy. Moreover, it should not be forgotten that even small effects may become significant if they are accumulated over the course of a child's school career (Alvidrez & Weinstein, 1999; Smith, Jussim, & Eccles, 1999), particularly if these effects begin early in the school year (Entwisle & Alexander, 1988).

Another purpose of this study was to highlight a possible mediating role played by student self-perception in the self-fulfilling prophecy effects. According to prior works (e.g., Bibik, 1999; Brattesani *et al.*, 1984; Jussim, 1989; Jussim & Eccles, 1992; Madon *et al.*, 2001; Parsons *et al.*, 1982) results showed that teacher expectations early in the year predicted student perceived ability late in the year, even after controlling for

initial student perceived ability. Moreover, results bring an evidence concerning the role of partial mediator of perceived ability in the confirmation process of teacher expectations, insofar as final perceived ability marginally predicted final score, even after controlling for teacher expectations. This influence may be explained by a differential treatment of high and low ability students, such giving more praise and feedback to high ability students and ignoring low ability students (Brophy, 1983).

Finally, contrary to Jussim's studies, this one didn't reveal the existence of perceptual biases of teachers during the swimming sessions, insofar as teacher expectations didn't predict final grade when controlling for student final score and perceived ability. Thus, it would appear that possibly erroneous prior teacher expectations concerning student ability didn't influence their student evaluation. One of the explanations may be that in physical education classes, probably more than in other situations of teaching, teachers frequently see their pupils "in action" and thus have numerous opportunities to evaluate them accurately and in a relevant way. Also, swimming is an activity in which teachers can use objective measures to evaluate student achievement (e.g., time, distance, involvement). So physical education teachers could be less subject to prejudices.

Study limitations and future directions

The results of this study are not meant to suggest that expectancies are always accurate or never have (large) self-fulfilling or biasing effects. It is necessary to limit the results of this study. As with all path analytic studies, these results must be interpreted cautiously: although many plausible predictors were controlled in this study, and although a reversal causal link is not conceivable (e.g., final marks and final scores did not cause teacher expectations at the beginning of the session), it is impossible to be

certain all relevant variables were controlled, particularly regarding motivational variables. No matter how many variables are included in a naturalistic study, it is always possible that a relevant one was omitted (see, e.g., Judd & McClelland, 1989). If we omitted a relevant predictor of teacher expectations, it would mean that teachers were basing their expectations on another personal characteristic of students that enabled them to accurately predict student achievement beyond levels accounted for by the variables assessed in this study. Thus, an omitted-variable is an accuracy alternative to the self-fulfilling prophecy explanation. Although this problem can never be completely overcome, it can be minimised with the inclusion of extensive control variables. Few naturalistic studies on expectancy effects in physical education classes take into consideration so many control variables as this study. Moreover, the variables assessed in this study predicted the main part of the variance of teacher expectations (58%), final scores on standardised tests (80%) and final grades (60%). This reduces the chances that a relevant predictor was omitted from the analyses, thereby decreasing the probability that relations between teacher expectations and student achievement were caused by uncontrolled factors. Further research, nevertheless, should investigate other possible mediators of teacher expectancy effects. Student perceived ability is probably not the only motivational mediator of teacher expectancy effects, and several other behavioural and psychological processes may mediate this phenomenon. Thus, futures research should consider other elements, such as objective measures of student motivation (e.g., provided effort, choice of task difficulties, perseverance after failure), or other self-reported measures. On this point, additional studies are needed to test other motivational perspectives, such as the self-determination paradigm (Ryan & Deci, 2000; Vallerand, Fortier & Guay, 1997) or the goal perspectives theory (Nicholls, 1989; Roberts, 2001).

Furthermore, this study dealt with mean effects. Indeed, it would be interesting to identify conditions under which each hypothesis would tend to appear more strongly in naturalistic studies (Madon *et al.*, 1997). One can put forward the hypothesis of a moderating influence of student socio-demographics factors such as age, gender, ethnicity and socio-economic status (Baron, Tom & Cooper, 1985; Jussim *et al.*, 1996), as well as personality characteristics (see Cooper & Hazelrigg, 1988; Neuberg, Judice, Virdin, & Carillo, 1993, for reviews in experimental laboratory studies).

Another limitation of our study may be the measurement of teacher expectations. Teachers had to use scales anchored with "very bad" and "very good" – i.e., without any reference to an objective performance. Some studies (e.g., Kobrynowicz & Biernat, 1997) provide compelling evidence that subjective judgements can mask the occurrence of stereotypes (in particular gender stereotypes) that are operating when participants have to use objectives estimates of performance. Indeed, according to the shifting standards model (Biernat, 1995), it seems that individuals adjust the meaning of the subjective scales according to their expectations for men and women regarding height, weight, income, and some personality attributes, which removes evidence of gender stereotypes. To uncover these differences and to assess teacher true mental representations of students, future research has to use response scales that are explicitly linked to an external anchor (e.g., estimates of behavioural frequencies, or standardised test scores).

In closing, the present findings seem to provide a more general picture of the complex relations between teacher expectations and student attributes and achievement in naturalistic setting. By highlighting the process by which students confirm teacher expectations, this study contributes to create some interesting perspectives for future

research on teacher expectations effects.

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Footnotes

1. In this study, student motivation was assessed through perceived ability. It may have been better to use objective measures (e.g., provided effort, persistence after failure). We think, nevertheless, that perceived ability is a pertinent self-reported measure of motivation, because prior works show that this variable is a principal determinant of motivational dynamic in academics (e.g., Bandura, 1986; Harter, 1985) and sports (e.g., Roberts, 2001) contexts (see below).
2. Preliminary analyses revealed that neither student gender nor initial grades was involved in the teacher expectation process. Consequently, these variables were not included in the analyses of this study.
3. The indirect effects of teacher expectations on student achievement, as mediated by student perceived ability, is the product of the two direct effects (0.33 times 0.08). For more details on indirect effects, see Jöreskog & Sörbom (1999).
4. Additional analyses were also carried out to test more precisely the mediating role of perceived ability between the teacher expectations and the student final score. We adopted the most straightforward approach, involving the comparison between several models (see Perugini & Conner, 2000): the model of Figure 2 called the partially mediated model (PMM), a fully mediated model (FMM) in which the path between the teacher expectations and the final score was removed, and a nonmediated model (NMM) in which the paths between the teacher expectations and final perceived ability, and between this and final score were removed. With FMM, the paths between the teacher expectations and final perceived ability ($\underline{\beta}$=0.33), and between this and the final score ($\underline{\beta}$=0.13) were significant, but this

model yielded poor fit indices: χ^2 (5) = 33.41, p < .0001, NFI = .96, CFI = .96, AGFI = .74, RMSR = .04. With NMM, the path between the teacher expectations and the final score (β = 0.33, p <.001) was significant and a little stronger than in the PMM, but this model yielded poor fit indices: χ^2 (6) = 36.72, p < .0001, NFI = .95, CFI = .96, AGFI = .78, RMSR = .10. Two chi-square difference tests were used to determine whether there was a significant difference between the fit of the PMM and the two other models. These differences were highly significant [all $\Delta\chi^2$(1or 2) ≥ 25.24, p <.001), suggesting that a partial mediation fit the data more. Moreover, inspection of the relevant parameters showed that the three criteria for mediation listed by Baron and Kenny (1986) were almost achieved (note that this test is more restrictive than the original one proposed by Baron and Kenny, because the mediation model is tested simultaneously with additional influences of other constructs on the predictor, the mediator and the outcome variables, which are likely to reduce the size of the influences). There was (1) an influence of the independent variable on the mediator (β = 0.33), (2) an influence of the mediator on the outcome variable (β = 0.13, p<.05, in the FMM), including when analyses adjust for the independent variable (β = 0.08, p =.08, in the PMM), and (3) the direct relation between the independent variable and the dependent variable (in the FMM) is a little bit reduced when analyses adjust for the mediator variable (from 0.33 to 0.28).

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Table 1. Descriptive statistics and interccorrelations among variables (N = 173)

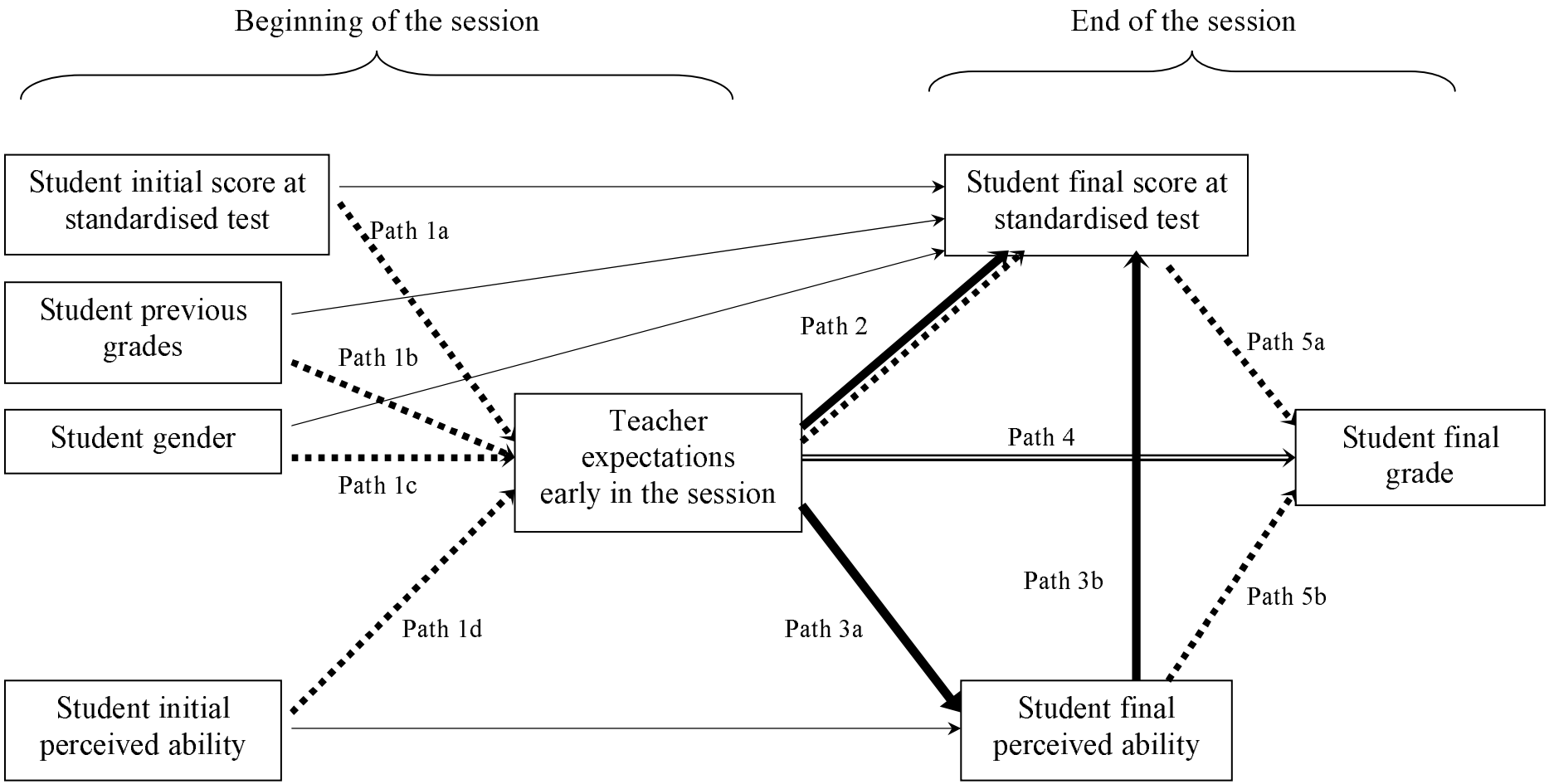
Variables	Mean	SD	1	2	3	4	5	6	7
Initial achievement									
1. initial grades	13.86	2.14	/	.30**	.29**	.21**	.25**	.31**	.26**
2. initial score	354.60	98.14		/	.57***	.76***	.64***	.87***	.58***
Initial motivation									
3. initial perceived ability	3.78	1.44			**.70**	.50***	.48***	.57***	.65***
Teacher expectation									
4. teacher expectation of student ability	4.48	1.31				**.73****	.65***	.79***	.57***
Final achievement									
5. final grade	13.44	3.54					/	.77***	.54***
6. final score	361.74	89.08						/	.59***
Final motivation									
7. final perceived ability	3.77	1.44							**.75**

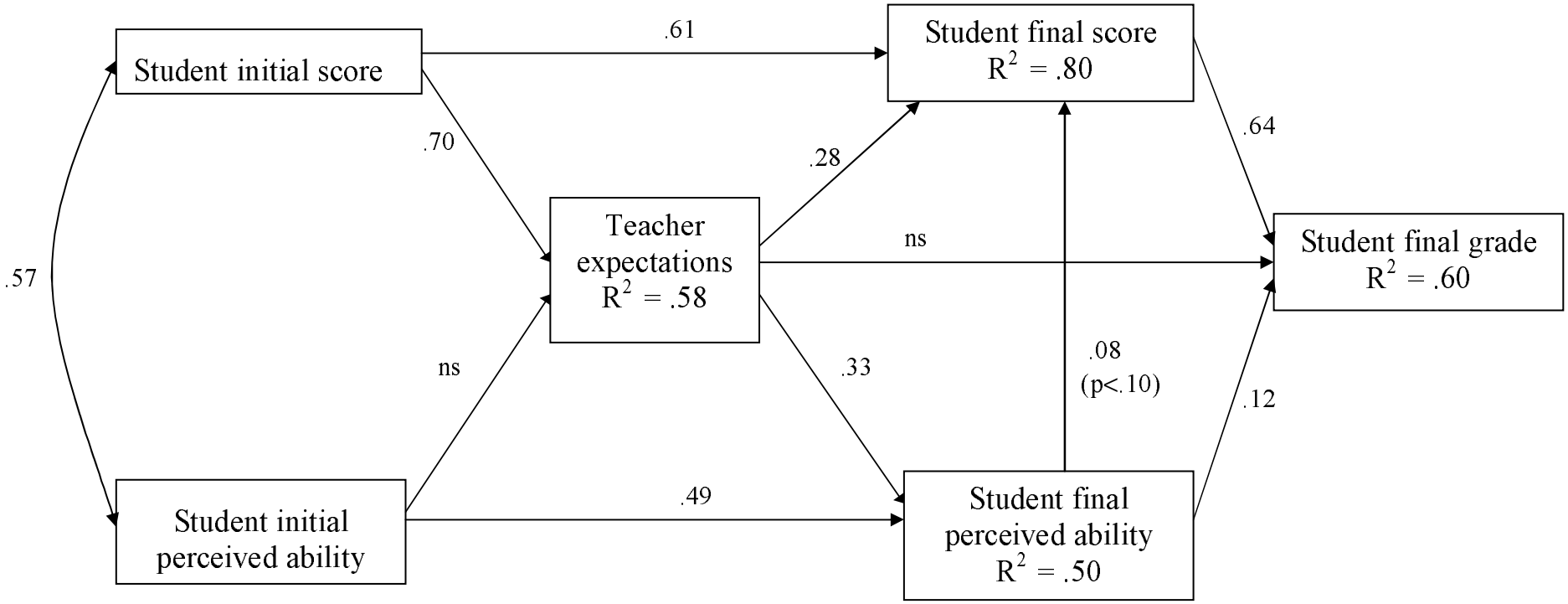
Note: The correlations among the variables of this study are above the diagonal. Cronbach alpha coefficients are presented on the diagonal, in thick. All correlations are independent of student classroom. These correlations were calculated by (a) obtaining residuals for each variable by regressing each variable onto dummy variables that represented student classrooms and (b) correlating the residuals. *p < .05. **p < .01. ***p < .001.

Figure Caption

Figure 1. Conceptual model of relations among teacher expectations, student attributes, and student achievement (adapted from Jussim, 1991). The thick lines translate the hypothesis of self-fulfilling prophecy, the double line translates the hypothesis of perceptual bias, the dotted lines translate the hypothesis of accuracy, and the thin lines translate the variables of control (i.e., the extent to which background informations predict student future behaviour or attributes, independent of the influence of teacher expectations).

Figure 2 : Test of the model. All coefficients are standardised.


Beginning of the session
End of the session
Student initial score at standardised test
Student previous grades
Student gender
Student initial perceived ability
Teacher expectations early in the session
Student final score at standardised test
Student final grade
Student final perceived ability
Path 1a
Path 1b
Path 1c
Path 1d
Path 2
Path 3a
Path 3b
Path 4
Path 5a
Path 5b


Student initial score
Student final score
R^2 = .80
.61
.70
.28
.64
Teacher
expectations
R^2 = .58
ns
Student final grade
R^2 = .60
.57
ns
.33
.08
(p<.10)
.12
Student initial
perceived ability
.49
Student final
perceived ability
R^2 = .50