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Effects of Playing Music during PE on Intrinsic Motivation of Students

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Abstract: The aim of this study was to investigate whether playing music during PE lessons had an impact on the intrinsic motivation of high school students, including enjoyment, competency, freedom of choice and stress. Using a mixed method approach, intrinsic motivation of 40 students (25 girls, 15 boys) was surveyed. The Intrinsic Motivation Inventory was combined with a focus group discussion to collect pupils' and teacher's perceptions. Data analysis showed motivation scores to be significantly better during PE with music than PE without music. This difference was also reflected for joy or interest, with pupils experiencing more joy during PE with music. Students reported feeling more enthusiastic with music, which gave them more energy; they participated with higher motivation and had more fun. In addition, the combination of increased concentration and self-confidence resulted in higher competence scores during PE with music. No significant differences were found for freedom of choice and stress in either condition. It can be concluded that playing music during PE positively influences students' intrinsic motivation. More specifically, the influence of music is mainly found in increased students' perception of enjoyment, interest and sense of competence. The findings of this study should be the impetus for PE teachers to implement music more often.

Keywords: physical activity; basketball; high school education; physical education; motivational learning climate; secondary school; high school; intrinsic motivation

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1. Introduction

The world was under the spell of the COVID-19 pandemic last year. In the process, the government imposed several restrictions that put normal life "on hold" for a while. These included the decision to close down sports infrastructure and suspend many competitions in different sports. This put pressure on sports in both competitive and recreational contexts. Yet during a pandemic, staying physically active is even more important. This is because regular exercise improves immunity and general health, making a body more resistant to disease [1]. Especially in a COVID-19 infection, a certain level of physical fitness appears crucial for a positive course of disease.

Sufficient physical activity is not only important for better disease progression; it is also important for disease prevention. For instance, the World Health Organization states that 63% of total deaths in the world are due to non-communicable diseases, often at too young an age between 30 and 70 years [2]. Among the causes of these diseases, such as cardiovascular diseases, cancers or diabetes, is physical inactivity. It is thus certain that insufficient exercise costs human lives worldwide.

Lack of sufficient physical activity was already a major issue in our current society and has become even more prominent during this pandemic. Especially in children and adolescents between 5 and 19 years, the prevalence of overweight and obesity has increased dramatically, according to the WHO [3]. Creating active physical activity habits is a crucial

component in the education of children and adolescents. The WHO states that, to address challenges inherent in these habits, public policies in sectors outside the health sector should be encouraged. Here, the school environment is the ideal, comfortable and safest environment to work on the physical inactivity phenomenon. In this environment, young people's physical activity time can be maximized and young people can work on their physical inactivity. An additional challenge is that a significant number of pupils are also insufficiently motivated to engage in physical activity during physical education classes. Research by Vlaanderen [4] on the impact of the COVID-19 pandemic on the sports behaviour of young people up to 18 years of age concluded that 75% of them participate in less physical activity than before the COVID-19 pandemic. The structural use of music which matches pupils' lifestyles during physical education lessons could be an additional motivating factor.

In fact, music appears to be important to adolescents and is a significant part of their lifestyles. Miranda [5] indicated that music influences important aspects of adolescent development and can be portrayed as a developmental tool during adolescence. Papinczak and Dingle [6] argued that listening to music is adolescents' favorite leisure activity and has an effect on social well-being. They found four aspects in which listening to music is related to well-being, namely, in building relationships, controlling emotions, adjusting thinking and emotional deepening [6]. In addition, Dearn [7] also concluded that popular music has an impact on young people's self-identity and that there is a relationship between young people, popular music and building friendships.

De Frère [8], in her systematic literature review, concludes that music can indeed exert a certain influence on society. For instance, music is used in various circumstances to create a certain atmosphere to make different experiences more pleasant or to prompt someone to do something [9–11]. Moreover, music can also make people feel happier and experience less stress or pain [12].

Next, De Frère [8] outlines that music also plays a significant role in sport. Results show that music can be used to motivate athletes to sustain certain efforts and to ensure that people experience less "burden" [12,13]. Furthermore, music often has a positive impact on mood during physical activity [12,14,15]. Finally, music can enhance sports performance [16,17].

Music can also play a role in physical education classes in several ways. First, music can support classroom management. For instance, Konukman and Harms [18] and Barney and Pleban [19] suggested using music as a stop-and-go signal. As long as music is playing, students are engaged in sports and movement activities. From the moment the music stops, they have to be quiet to receive new instructions or listen to an explanation. This provides structure to shape the lesson and reduces inappropriate pupil behaviour [18].

Music can also contribute to the learning process. Barney and Pleban [19] indicate that teachers find that students are more focused and active during PE lessons with music and are therefore more likely to master a skill. They feel more comfortable and are more willing to participate and try new things. Konukman and Harms [18] also conclude that music has a beneficial effect on students' concentration based on the results of their study.

Subsequently, music also appears to have an impact on better performance in PE lessons. Deutsch and Hetland [20] report that children score significantly better on the PACER test when music is playing. In the study by Konukman and Harms [18], results show that children throw further on an overhead throwing exercise when music is played. Music with a higher number of beats per minute was also found to motivate and encourage students to focus better on the task and helped them to follow the pace of the activity better [18]. Music also increased students' physical activity during physical education classes. Brewer and Barney [21] found among high school students that basketball and volleyball classes with music had significantly more steps and significantly longer exercise time compared to classes without music. A later study of university students also found that the two basketball classes with music had significantly more steps and movement time recorded than the classes without music [22]. Furthermore, Barney and Prusak [23] also

found a significant difference in children during frisbee lessons and walking activities, with higher step counts recorded in the conditions with music. Students also claimed to be more willing to be active while listening to fast-paced music [23].

Finally, music has also been found to exert a positive influence on student motivation and, by extension, on the classroom atmosphere. In the study by Barney and Leavitt [24], teachers indicate that music helps create an enjoyable and positive classroom climate and that students are more engaged, more active and less distracted as a result. Students themselves find the lesson more enjoyable with music and claim to be more motivated to be active. Barney and Pleban [19] conclude that students are happier and more motivated with the implementation of music in physical education classes. Similarly, Brewer and Barney [21] find that students experience more enjoyment during physical activities when music is heard. In turn, Barney and Christenson [25] find that music is a good addition to PE lessons. Digelidis and Karageorghis [26] conclude through a self-determination survey that students score significantly higher in class satisfaction, intrinsic motivation and identified regulation, and report lower scores for external regulation and amotivation during classes with music. All these findings support the idea that using music helps create a positive classroom atmosphere and encourages students to participate in class.

In the studies by Barney and Leavitt [24], Barney and Pleban [19] and Barney and Christenson [25], teacher perceptions are used to draw conclusions about student motivation. In the study by Brewer and Barney [21], students themselves are surveyed, but only the level of enjoyment is examined. Digelidis and Karageorghis [26] examined intrinsic-extrinsic motivation in learners by probing intrinsic motivation and identified regulation, external regulation and amotivation using the Situational Motivation Scale (SIMS). In their study, the main focus is on whole motivation.

Because different forms of motivation have a different impact on the sustainability of students' participation in physical activities, it is important to differentiate between them when conducting a study. Ryan and Deci [27] established a self-determination continuum showing different types of motivation.

On the far left of the continuum is the zone of amotivation or lack of motivation. Students who do not value, have no interest in or do not want to participate in an PE class are located here. The middle zone is the zone of extrinsic motivation, which is divided into subcategories. In this type of motivation, students often start participating in PE class because they are obliged by the teacher or parents or because it is expected of them. The types of extrinsic motivation close to intrinsic motivation in the continuum are characterized by experiencing relevance or self-esteem. On the far right of the continuum, the zone of intrinsic motivation can be found. This is the strongest type of motivation and is therefore decisive in remaining motivated to participate in physical activity. When pupils are intrinsically motivated, they do something because they really like it or find it very interesting. Such pupils will freely participate in physical education classes and even enjoy or look forward to it. They will also learn more thoroughly and be more energetic.

Thus, with a view to lifelong physical activity, which should be a main goal of every physical education teacher, it is crucial that pupils are sufficiently intrinsically motivated during physical education classes from an early age onwards. If music could help with this, it would be a big advance. The question therefore arises as to whether music can have an effect on pupils' intrinsic motivation during physical education classes.

2. Materials and Methods

2.1. Research Design

A mixed method design was used for this study. Both qualitative and quantitative data were collected. First, the intrinsic motivation of third-grade secondary school students was surveyed using a questionnaire, followed by a focus group discussion to gain more insight into their thinking patterns. Afterwards, teachers' opinions were also asked. In this way, the results of the quantitative study were checked against students' and teacher's perceptions.

Students participated in one full physical education class without music and one full physical education class with music, of two periods each. The sequence is shown in the research design in Figure 1. During these class periods, basketball was taught. Both lessons were designed with quasi-identical practice and competition forms, so that any effect of the teaching concept could be ruled out.

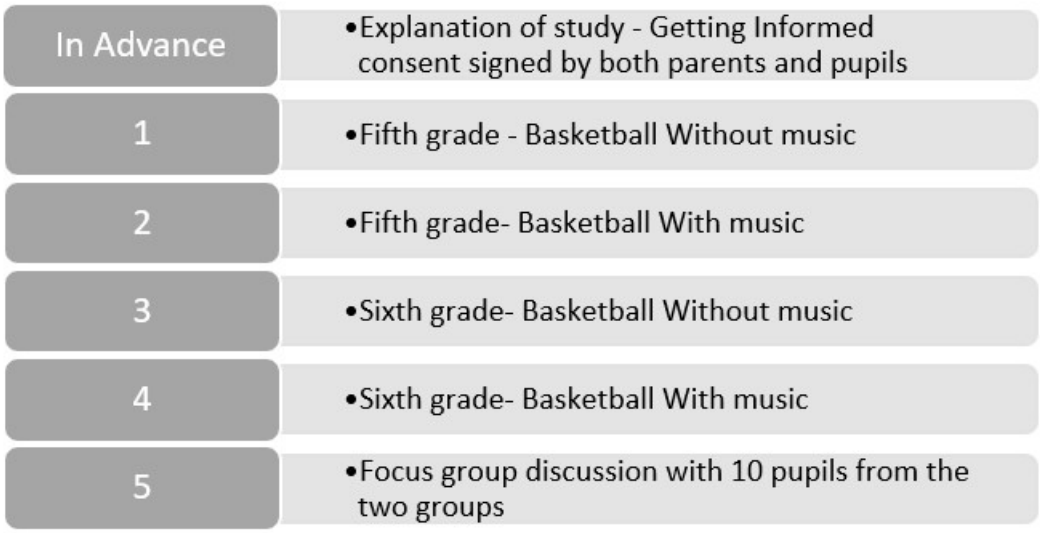

Figure 1. Research design.

To answer the research question: "How does playing music during physical education lessons affect the intrinsic motivation of secondary school students in the third grade?", the motivation scores from the lesson without music were compared with those from the lesson with music. The scores from this questionnaire were analyzed in the computer program, IBM SPSS Statistics 26 [28]. The answers to the different questions were entered per question and per person. In addition, the data from the focus group discussion were used to interpret the results obtained.

The music was chosen using the top forty hit list of QMusic, one of the most popular radio stations in Belgium, at the time of the survey. The first thirty songs from it were added to the playlist of this study. In this way, contemporary music was chosen that corresponds to the pupils' lifestyles. The playlist could be heard throughout the lesson, which means that music was also played during the transfers to and from the sports hall and during changing.

The survey was preceded by explaining purpose, method and course to both parents and students. Afterwards, all subjects also had to sign an informed consent to confirm their participation. For minor students, parents also had to sign this informed consent. Figure 1 shows the full study design.

2.2. Measurement Instrument

Students' intrinsic motivation was surveyed using the Ryan and Deci [27] Intrinsic Motivation Inventory. The questionnaire used in this study included 22 statements, which required students to indicate the extent to which they agreed or disagreed with a particular statement using a seven-point Likert scale. In this way, participants' perceptions of a particular condition could be determined.

The Intrinsic Motivation Inventory has already been used in several studies related to intrinsic motivation and self-regulation [26,29,30]. McAuley and Duncan [31] and McAuley and Tammen [32] examined the validity of the Intrinsic Motivation Inventory. Both studies concluded that the IMI had good validity as a measurement instrument. Reliability was checked in the study by Tsigilis and Theodosiou [33], in which the questionnaire was found

to be sufficiently reliable. It could therefore be concluded that the Intrinsic Motivation Inventory, which was used in this study, is reliable and valid.

The questionnaire focused on four main pillars within intrinsic motivation. Thus, questions 1, 5, 8, 10, 14(R), 17 and 20 were about interest or joy. Perceived competence was questioned using questions 4, 7, 12, 16 and 22. Questions 2(R), 6, 9(R), 13 and 18 measured pressure or tension, and questions 3, 11(R), 15, 19(R) and 21(R) were about perceived freedom of choice. Some questions were scored inversely, and this was indicated by the letter R. In particular, the first three pillars were determinants of intrinsic motivation. The fourth pillar, namely, perceived choice, was less relevant in this educational setting, as physical education is a compulsory subject within secondary education. One could therefore question the extent to which students can make a particular choice within a compulsory subject.

To make data collection attainable, an online tool (shown in Figure 2) was used to administer this questionnaire to the students. This made it easier for the students to complete the questionnaire and also allowed for more efficient data processing for the researcher. The students had to complete the questionnaire twice, once after the lesson without music and once after the lesson with music. For students who did not have a smartphone, a paper version of the questionnaire was provided.

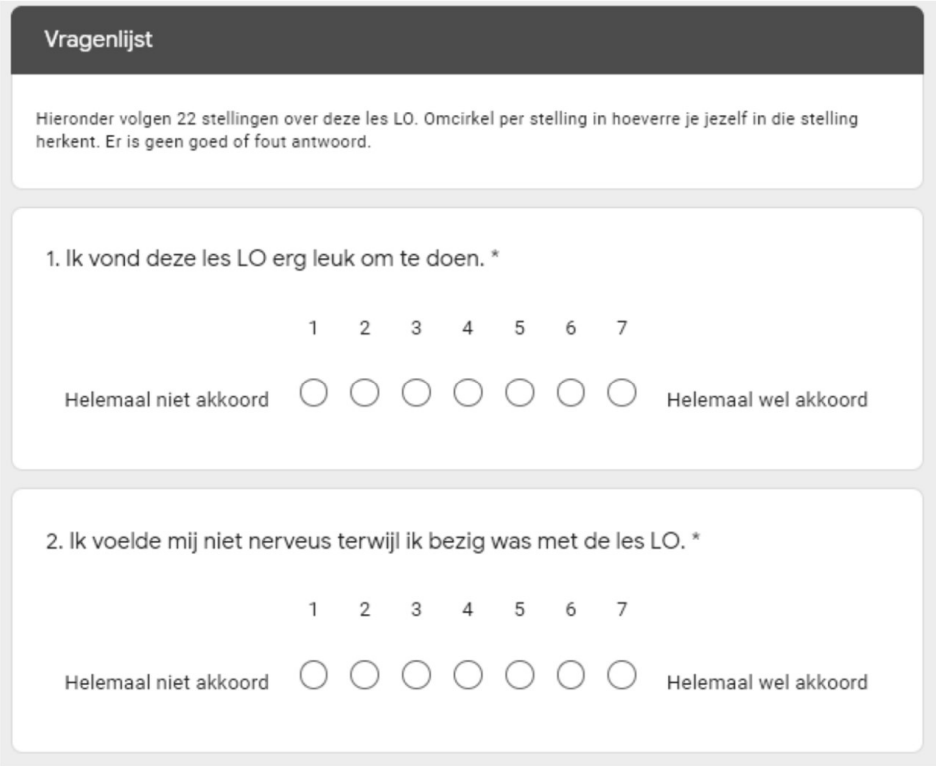

Figure 2. Digitalized Intrinsic Motivation Inventory.

The online tool consisted of two sections. Section one was the data collection, where some personal data such as name, age, gender and class were collected. These data were necessary to conduct later analyses with and possibly also to see if age and gender affect any difference in motivation. Ethical approval was obtained through the Ethics Committee for Human Sciences of the Vrije Universiteit Brussel.

The second section included the Intrinsic Motivation Inventory [27]. This section followed 22 statements about the physical education lesson, in which students had to indicate the extent to which they completely disagree or completely agree. A seven-point Likert scale was used, as shown in Figure 2. In both conditions, with and without music, the same 22 questions were asked. However, in the condition with music, one more

statement was added, namely, the statement, "The music that was played is close to my music taste". This also made it possible to gauge whether the music was indeed close to the students' lifestyles.

A focus group discussion was thus also held in addition, discussing the pupils' perceptions. The teacher of both groups was also surveyed. The qualitative data from this conversation were kept and were subsequently used to frame the quantitative data.

2.3. Participants

A complete within-design was used. This means that all subjects attended both a lesson without and with music. The advantage of this design is that individual differences are directly displayed and do not affect correlation. In addition, such a study also has more power and a higher probative value. This design requires half as many participants as a between-design. The participants were third-grade secondary school students who took physical education classes with them. Only subjects for whom a signed informed consent was obtained participated in the study. For underage subjects, a signed informed consent was also obtained from their parents.

Subjects were selected through convenience sampling. This meant that the researcher himself selected a school based on easy accessibility. This school was found willing to participate because the researcher had already established a positive connection through previous collaboration. The researcher herself taught in that school and, for practical reasons, selected classes that she herself taught. Students from the selected classes were then asked to participate in the study. This recruitment method was chosen by analogy with previously conducted research. For instance, in the Brewer and Barney [21] study, all subjects came from the same school. The researchers also chose the school where their research took place. As teaching is very context bound, this form of practical research seems most appropriate to better capture the perceptions of one's own students and also to be able to use the results of the conducted research in a targeted way.

The sample size was calculated using GPower. At a confidence level of 80% and a margin of error of 5%, 36 subjects were needed to draw a sufficiently reliable sample. An "oversampling" was factored in to account for possible drop-out. Students could possibly be absent at the time of the study or might not have wanted to participate in the study.

A total of 43 subjects were recruited from two different groups. There was a drop-out of three subjects where one subject refused to participate, and two subjects were absent from at least one of the two classes. Thus, 40 subjects eventually participated in the study, including 25 girls and 15 boys. The number of participants was homogeneously distributed across the study years. Thus, 20 students from the fifth year of study and 20 students from the sixth year of study participated. Students from the following disciplines participated in the study: Latin–Modern Languages (14), Economics–Modern Languages (11), Latin–Mathematics (11), Greek–Latin (3) and Latin–Science (1).

Afterwards, five more subjects from each group were randomly selected to participate in the focus group discussion. This interview was thus conducted with ten participants, and it probed their own perceptions of the research findings.

3. Results

3.1. Quantitative Results on Student's Intrinsic Motivation

A paired sample *t*-test was used to investigate whether music has an effect on secondary students' intrinsic motivation during physical education classes. The mean and standard deviation of scores on intrinsic motivation in both conditions are shown numerically in Table 1 and graphically in Figure 3. A significant difference ($p < 0.01$) was found in intrinsic motivation according to the presence or absence of music. Motivation scores during the lesson with music (4.40 ± 0.54) were significantly better than scores during the lesson without music (4.11 ± 0.58), meaning that students who participated were more motivated in the lesson with music.

Table 1. Averages and standard deviations on the different scales in both conditions.

Subscales	Means/SD	
	With Music	Without Music
Intrinsic motivation **	4.11 ± 0.58	4.40 ± 0.54
Enjoyment **	5.35 ± 1.19	6.12 ± 0.72
Competence *	4.70 ± 1.07	5.01 ± 0.99
Freedom of choice	4.35 ± 1.15	4.40 ± 1.29
Pressure/Tension	2.03 ± 1.03	2.07 ± 1.06

* Significant at 0.05 level ** Significant at 0.01 level.

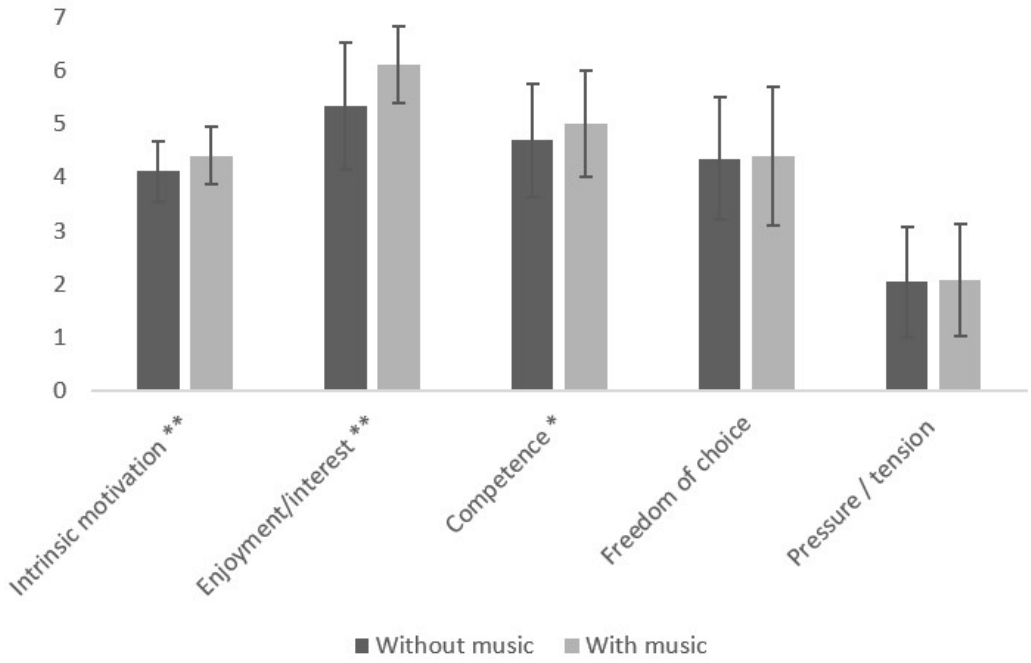

Figure 3. The mean and standard deviations of intrinsic motivation, enjoyment, competence, choice and pressure among students during the condition without and with music * Significant at 0.05 level ** Significant at 0.01 level.

In addition, it is also important to outline exactly what influence music has. The subscales pleasure, competence, freedom of choice and strain were therefore also subjected to a paired sample *t*-test. The means and standard deviations on the different scales in both conditions are again shown numerically in Table 1 and graphically in Figure 3. A significant difference ($p < 0.01$) was found in pleasure or interest according to the music condition. Students reported greater enjoyment or interest in the lesson with music (6.12 ± 0.72) compared to the lesson without music (5.35 ± 1.19). In addition, a significant difference ($p < 0.05$) was also found in competence between the two conditions. Thus, students felt more competent during the lesson with music (5.01 ± 0.99) than during the lesson without music (4.70 ± 1.07). Scores during the condition with music on the subscales of freedom of choice (4.40 ± 1.29) and pressure or tension (2.07 ± 1.06) were better than scores during the condition without music on the subscales of freedom of choice (4.35 ± 1.15) and pressure or tension (2.03 ± 1.03). However, these differences were not significant ($p > 0.05$). Therefore, we can state that playing music has no influence on students' choice and pressure or tension during physical education class. The influence is mainly found in increased enjoyment, interest and sense of competence.

A Three-way Repeated Measures ANOVA analysis was conducted to test whether the difference in motivation between the condition without music and the condition with music depended on gender, year of study or study orientation. The interaction effects between the music condition and gender, the music condition and year of study, and the music condition and discipline were not found to be significant ($p > 0.05$). Thus, the

difference in intrinsic motivation, enjoyment, competence, choice and pressure according to the presence or absence of music did not depend on gender, year of study or field of study. Further analyses were conducted to examine whether there was a difference between intrinsic motivation and the subscales according to gender, year of study or field of study, independent of music condition by means of a One-Way ANOVA.

We further examined whether there was a difference in intrinsic motivation, enjoyment, competence, choice and pressure between boys and girls during the condition without and with music. Figure 4 shows the mean and standard deviations of intrinsic motivation, enjoyment, competence, choice and pressure in boys and girls separately during the condition without (WOM) and with music (WM). For almost all scales, boys seem to score better than girls in both conditions, although not all differences were found to be significant. For instance, no significant differences ($p > 0.05$) were found for intrinsic motivation, enjoyment and choice between boys and girls in both conditions. For the competence subscale, no significant difference ($p > 0.05$) was found between boys and girls during the condition without music, but it was found during the condition with music ($p < 0.05$). Thus, boys felt more competent during the Physical Education class with music compared to girls. For the pressure subscale, no significant difference ($p > 0.05$) was also found between boys and girls during the condition without music, but it was found during the condition with music ($p < 0.05$). Girls felt more pressure and tension during the class with music than boys.

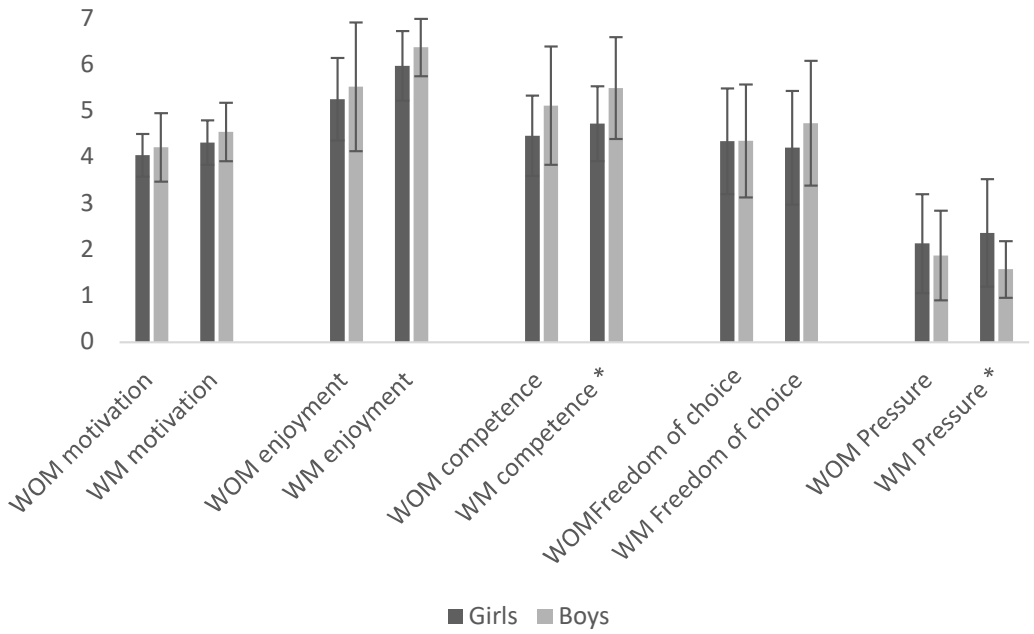

Figure 4. Mean and standard deviations of intrinsic motivation, pleasure, competence, choice and pressure by gender during the condition without (WOM) and with music (WM). * Significant at 0.05 level.

It was also examined whether fifth-year and sixth-year students differed in terms of intrinsic motivation, enjoyment, competence, choice and pressure during the PE lesson with and without music. Figure 5 shows the mean and standard deviations of intrinsic motivation, enjoyment, competence, choice and pressure in fifth-year and sixth-year students separately during the condition without (WOM) and with music (WM). No significant differences ($p > 0.05$) were found in pleasure, choice and pressure between fifth-year and sixth-year students and this for both conditions. For intrinsic motivation ($p < 0.01$) and the competence subscale ($p < 0.05$), a significant difference was found between fifth-year and sixth-year students in both conditions in the condition with music. Fifth-year students reported feeling more competent and motivated with music compared to sixth-year students.

In the condition without music, no significant differences ($p > 0.05$) were found for any of the scales.

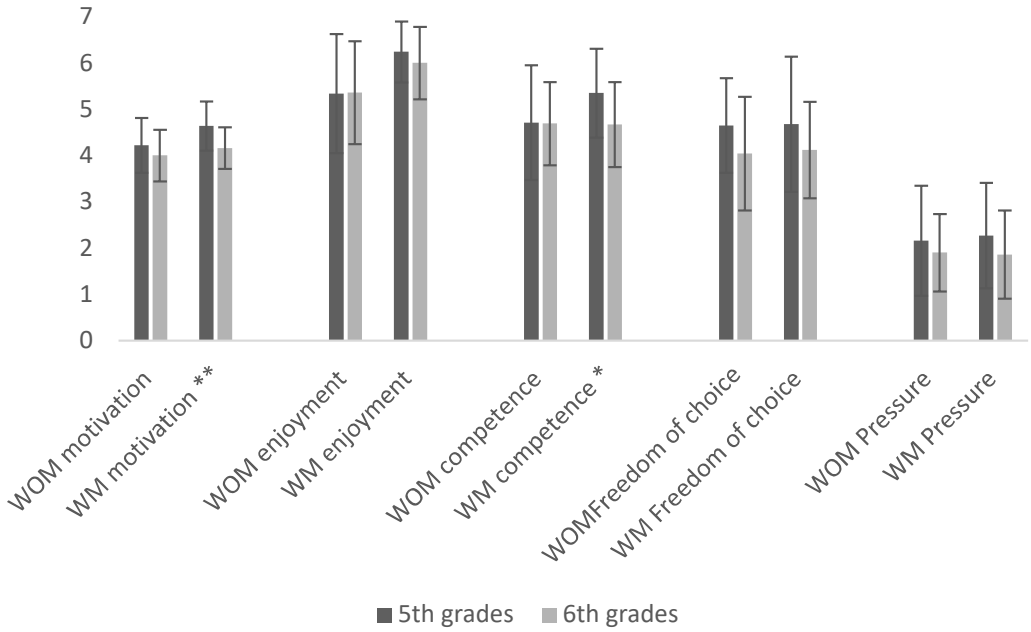

Figure 5. The mean and standard deviations of intrinsic motivation, enjoyment, competence, choice and pressure in the condition with (MW) and without (WOM) music for 5th and 6th grade students. * Significant at 0.05 level ** Significant at 0.01 level.

It was also investigated whether there was a difference in intrinsic motivation, enjoyment, competence, choice and pressure between students from different disciplines in the condition with and without music. The five orientations—Latin–Modern Languages (14), Economics–Modern Languages (11), Latin–Mathematics (11), Greek–Latin (3) and Latin–Science (1)—were integrated for this purpose. No statistical differences ($p > 0.05$) were found in motivation, enjoyment, competence, choice or pressure between the different fields of study in either condition.

The internal consistency of each subscale was examined via Cronbach's alpha analysis. For all subscales, Cronbach's alpha, both for the condition without music and for the condition without music, was calculated. An alpha of 0.50 was classified as moderate internal consistency, while an alpha from 0.70 onwards meant good—and from 0.90 onwards very good—internal consistency. The Cronbach's alpha and descriptive statistics of each subscale can be found in Table 2.

Table 2. Mean and standard deviations and Cronbach's alpha by subscale of intrinsic motivation.

Subscales	Items	Mean/SD		Cronbach's Alfa	
		With Music	Without Music	With Music	Without Music
Enjoyment	7	5.35 ± 1.19	6.12 ± 0.72	0.961	0.889
Competence	5	4.70 ± 1.07	5.01 ± 0.99	0.894	0.891
Freedom of choice	5	4.35 ± 1.15	4.40 ± 1.29	0.571	0.745
Pressure/Tension	5	2.03 ± 1.03	2.07 ± 1.06	0.733	0.737

The pleasure or interest subscale consisted of seven items, namely questions 1, 5, 8, 10, 14(R), 17 and 20. The internal consistency of this subscale was found to be good to very good. The next subscale competence involved questions 4, 7, 12, 16 and 22 and thus consisted of five items. In both conditions, internal consistency was rated as good. The subscale choice had five items, namely 3, 11(R), 15, 19(R) and 21(R). In the condition with music, this subscale had good internal consistency, but in the condition without music,

internal consistency was rather poor. The difference in Cronbach's alpha between the two conditions could possibly be explained by the fact that there are actually few choices in a "compulsory" physical education class. Finally, the pressure or tension subscale with its five items—2(R), 6, 9(R), 13 and 18—achieved good internal consistency in both conditions.

3.2. Quantitative Results on Student's Intrinsic Motivation

To provide deeper insights into the research findings of the quantitative data collection, a focus group discussion with the pupils and individual discussion with the teacher were conducted. Pupils intrinsically showed greater motivation in the lesson with music than in the lesson without music.

Students clarified this during the focus group discussion with the expressions below:

> "In fact, I also felt more motivated during lessons with music. I think it also depends on the kind of music played. The genre I mostly heard was hip pop music, which gives us a mental boost and makes us more active".

> "Music encourages us to spontaneously move the body more".

> "Most pupils like music and the combination of sports and music makes us more engaged".

Overall, pupils reported feeling more enthusiastic when music is played during exercise. They indicated that this gives them more energy and makes them more motivated to participate. The teacher noted that students seemed much happier and that there was a fun atmosphere, which, in her perception, made students seem more motivated to participate.

The difference in enjoyment or interest according to the music condition, with pupils experiencing more enjoyment during the lesson with music compared to the lesson without music, was mainly explained by the pupils:

> "You no longer stand still between exercises but sing and dance along with the songs".

> "Music causes a certain substance to be released in the brain that makes us feel more energetic and happy because of those songs with tempo".

> "Music makes me happier, which also allows me to have more fun".

The teacher also noted that students often danced and sang, which seemed to make them have more fun during class with music. The teacher did note that this sometimes caused them to lose focus, causing the actual given task to slip a little.

The pupils also felt more competent during the class with music.

Several students confirmed this by stating that:

> "When you hear music like the kind that was played you get a confidence boost because of the rhythms".

> "Music distracts and makes us compare ourselves less with others. Thanks in part to the relaxed atmosphere and team spirit, we also feel more competent".

> Yet another student commented: "Music gives energy, so students are going to put much more effort into achieving certain goals than when there is no music".

The teacher observed that in the lesson with music, the pupils were able to perform certain exercises better than usual. They were more active and practiced more, which made them perform better. Playing music did not affect pupils' sense of choice, pressure or tension according to the music condition. Students view freedom of choice quite narrowly. Students formulate it as follows:

> "PE still remains a compulsory subject. So pupils don't really have the choice not to participate".

> "Music doesn't change the choices we have".

The absence of an effect on pressure or tension did cause mixed reactions. For instance, pupils indicated:

> "Personally, I felt less pressure and was more relaxed during class with music".

> "Music doesn't necessarily change the pressure put on pupils. The need to perform is still there".

> "During competitions, no one wants to disappoint their teammates and everyone does have a bit of a fear of being told off or mean, so some pressure remains".

The teacher indicated that no choices were offered in both lessons on the grounds that curriculum objectives must be achieved.

> "The physical education subject is a compulsory subject in the curriculum of participating students and therefore a student cannot really choose whether to participate or not".

In addition, the teacher also felt that music does not really have an effect on the pressure or tension imposed.

> "This rather depends on the peers or the teacher himself to what extent pressure is imposed".

Analysis of the interaction effects between the music condition and gender or discipline showed that the difference in intrinsic motivation, enjoyment, competence, choice and pressure according to the presence or absence of music was not dependent.

> "I would have thought that girls would have a bigger difference in motivation, since girls sometimes don't like to play sports, but with music they like to play sports. With boys, you would think this difference would be less".

> "The difference in motivation without and with music does not really depend on your gender, field of study or year of study, but rather on your personality".

The teacher also indicated that gender, field of study or year of study do not determine the difference between the condition without and with music.

The teacher herself also indicated that she could not say exactly who had increased the most in motivation. In her perception, for example, the increase in motivation of fifth-year Latin–Modern Languages girl was similar to that of a sixth-year Latin–Mathematics boy, so she could not really identify a difference in terms of gender, year of study or field of study either.

The subscales also showed that no differences were noticeable in intrinsic motivation related to enjoyment and free choice between boys and girls, both in lessons without and with music.

> "Girls and boys today usually have the same motivation, enjoyment and free choices in everyday life. This is no different in PE class".

> "For both boys and girls, PE class is a pleasant break during a mostly boring school day".

The teacher also felt that there was no real difference between boys and girls in terms of intrinsic motivation and enjoyment in both groups.

> "Some girls are more motivated than other girls and some boys are less motivated than their gender counterparts, but overall the average motivation is the same. In terms of choices, it is indeed the same for both genders, as no choices were offered for either gender".

There was, however, a difference in sense of competence between boys and girls in the lesson with music. Boys felt more competent during the PE lesson with music compared to girls. In the lesson without music, admittedly, there was no difference.

> "I didn't expect there to be no difference in the lesson without music. I did expect the boys to feel more competent than the girls, because girls are generally a bit more insecure than boys, especially when it comes to physical abilities".

> "I think music has a bigger impact on boys' mindset. I think boys experience music as an extra encouragement and therefore think they play better".

In the teacher's perception, a difference in competence between girls and boys was not immediately noticeable. However, the lesson with music was more of a refresher lesson and perhaps the boys had already mastered the techniques better, which made them feel more competent.

Next, there was also a difference in pressure or tension between boys and girls during the condition with music, with the girls feeling more pressure and tension compared to the boys. In the lesson without music, there was no difference in pressure or tension based on gender.

> "I thought girls experience more pressure during PE classes anyway. I think this result can be explained by the boys' competence. If the boys think they are going to play better, they also radiate this and girls probably feel more pressure to match this performance".

The teacher did not really expect this result. One possible explanation could be linked to the boys' higher sense of competence that lesson. Thus, girls might feel more pressure because they see the boys doing it all right.

During analyses based on year of study, there appeared to be no differences in enjoyment, choice and pressure between fifth and sixth years, both in lessons without and with music.

> "I think it's because sixth-form students are a bit done with school. I think our motivation is a bit lower. It's time for another step into higher education".

The teacher saw no difference in intrinsic motivation between the two groups. Possibly, though, this small difference could be explained by the timing of the condition with music. For the fifth-grade students, this was just before a holiday, which the students were looking forward to. For the sixth-grade students, the PE class with music was held after the holidays. Perhaps intrinsic motivation was slightly lower because they had to come back to school.

Finally, it was also found that there were no differences in motivation, enjoyment, competence, choice or pressure between the different subjects during both conditions.

> "I think this makes sense because the physical education class is the same across all study orientations. I think the study orientation is separate from the PE class and therefore it doesn't make a difference".

> "I think this is because we are all still in the same year and experience this similarly. Music doesn't have much to change this I don't think".

The teacher also indicated that the different fields of study are taught together in one group, which means that the pupils generally experience this in a similar way anyway.

4. Discussion

Results show that playing music during physical education lessons has a positive impact on the intrinsic motivation of secondary school students in third grade. Thus, significantly better overall motivation scores were found in the lesson with music compared to the lesson without music. Overall, students reported being more enthusiastic with music, feeling more energetic and participating with more motivation. These results confirm research findings of Barney and Leavitt [24], Barney and Pleban [19], Barney and Christenson [25], Brewer and Barney [21] and Digelidis, Karageorghis [26].

When identifying the form of influence, it was found that adding music did not affect students' sense of freedom of choice during physical education lessons. To elapse this

component, there could be added value in giving students responsibility over music choice at the time of the lesson itself.

Related to free choice about participation in PE, intrinsic motivation did not increase because pupils feel less able to co-steer the course of the lesson and because PE is a compulsory subject in the curriculum. In addition, the curricula stipulate that a number of sports must absolutely be covered. This makes it difficult for teachers to give pupils extensive choices every lesson. On the other hand, teachers can offer choices of participation to pupils within these outlines. On the eve of the implementation of new attainment targets for PE, it seems that the government has created the opportunity to provide pupils more freedom of choice by defining the sports to be taught less specifically.

Subsequently, music did not affect pupils' perception of pressure or tension. Several pupils indicated that music does not actually change the pressure they feel, as the need to perform is still there. For instance, during competitions, some pupils do not want to disappoint their teammates, so some form of pressure is always created anyway. According to students, it depends on (perceived) expectations from fellow pupils or teachers.

Playing music did affect enjoyment or interest. Students experienced more pleasure and showed more interest during PE classes with music. Previous research showed that playing music stimulates the production of dopamine, a neurotransmitter that provides pleasure [12]. Together with endorphins, dopamine creates a more excited state of mind. This could explain why the students felt more pleasure during and more interest assignments during the PE class with music. The pupils themselves also indicated that they sang and danced along to the music which made them feel more fun during the PE class. From the teacher's perspective, this behaviour also has a negative element. When pupils sang and danced too much, she found that pupils lost focus on the actual task, and this disrupted the achievement of pre-set learning goals.

It was also found that playing music has an impact on perceived competence. Students felt more competent during the PE class with music. Several students reported that music caused their self-confidence to rise, making them feel more competent. This finding confirms findings in previous research by Gangrade [12]. The beat of the music stimulates brainwaves, allowing a person to work much more focused [12]. The students were also more active and practiced more, allowing them to perform the movements better. The combination of increased concentration and increased self-confidence resulted in a more intense moment of practice and an increased sense of competence among students when music was used during PE class. The effect of music in PE class manifested itself mainly in increased enjoyment, interest and sense of competence.

It was further found that the difference in intrinsic motivation, enjoyment, competence, choice and pressure according to the presence or absence of music did not depend on gender, grade or discipline; that is, gender, discipline or year of study do not determine the difference between the condition without and with music. These results suggest that all students show roughly equivalent increases in intrinsic motivation according to music condition. While previous research on perceived autonomy and intrinsic motivation shows that gender differences can be identified, we cannot confirm this with this study [34]. This may be due to the fact that this study did not compare participation in different activities, so the underlying factor (task or ego orientation) was not part of the research design.

There was a difference in perceived competence and pressure or tension between boys and girls in the class with music. Boys felt more competent during the PE lesson with music, while girls felt more pressure and tension in the PE lesson with music compared to the boys. Students explained this effect by stating that, in their opinion, music has a greater impact on boys' mindset. They argued that boys experience music as an extra encouragement, which makes them think they can play better. Possibly, the order of the conditions also had an impact on this research result. Because both lessons had to look roughly the same to rule out a possible effect of the lesson concept itself, the second lesson, the one with music, became more like a refresher course of the one without music. So, it is quite possible that boys might have already mastered the movements taught better, which

made them feel more competent. Previous research shows that enjoyment is a mediating factor for girls' perception of competence [35,36]. The choice of football as a lesson topic, a sport generally more popular with boys than girls, may explain the gender difference.

Furthermore, there was also a difference in pressure or tension, with girls feeling more pressure or tension only during lessons with music compared to boys. A possible explanation could be linked to the boys' higher sense of competence during the lesson with music. If boys think they are going to play better, they radiate this, and girls are likely to feel more pressure to match this performance. Thus, girls might feel more pressure because they see the boys doing it all right.

Next, differences in intrinsic motivation and perceived competence between fifth- and sixth-graders were found during the lesson with music. Thus, fifth-graders felt more motivated and competent with music than sixth-graders. In the lesson without music, there was no difference in intrinsic motivation and sense of competence, according to year of study. The students indicated that the difference in intrinsic motivation could possibly be explained by the fact that the sixth-graders have been at school longer and are a bit tired of it, which is confirmed by Yurt [37].

The results of this study should encourage the use of music in teaching practice. At the micro level, each physical education teacher should consider whether music can be integrated into the lessons, as the positive effect on motivation was proven. In addition, the implementation of music should also be worked on at the meso-level. For instance, the subject PE team could play an important role in developing specific guidelines concerning the use of music in PE lessons throughout the school. Finally, also at the macro level, the subject PE team could liaise and share insights with other subject teams to jointly consider whether music could be useful in other subjects and whether there might be room in school policy for music implementation.

The internal consistency of each scale was examined using a Cronbach's alpha analysis that reflected the degree of consistency between the items of a scale. Results indicated generally good internal consistency across all subscales. In combination with results from previously conducted research by Tsigilis and Theodosiou [33], we can therefore conclude that the Intrinsic Motivation Inventory [27] as a measurement instrument was sufficiently reliable for this study. The validity of the measurement instrument was also found to be good in previous studies by McAuley and Duncan [31] and McAuley and Tammen [32]. Therefore, based on previous arguments, it can be said that the Intrinsic Motivation Inventory, which was used in this study, is sufficiently reliable and valid.

Finally, this study also had some limitations. Because of the specific school context, the researcher selected participants through convenience sampling in the school where the researcher was employed. Convenience sampling within one school ensures that the results do not give a representative picture of all secondary school pupils in Flanders, making inference virtually impossible. However, the question of whether a large-scale study would be useful remains open because the specificity of the class context is very decisive for the choices a teacher makes when designing a powerful learning environment. All participants participated in a compulsory physical education class, which already limited free-choice opportunities. This ensured that intrinsic motivation scores could not—or only to a limited extent—be strengthened for this factor.

Currently, further research is needed to investigate the influence of music on other movement activities and to see whether music can exert its role as a motivator in all physical education lessons. In addition, further research is also needed to investigate which specific music has the most reinforcing effect. For example, there might be differences in motivation scores according to classical, rock or pop music, or according to whether fast or slow music is played. Further research on how teachers can increase pupils' experience of autonomy within the given context and what impact this has on intrinsic motivation could create additional value for the research domain.

5. Conclusions

The purpose of this study was twofold. On the one hand, it aimed to investigate whether playing music during physical education classes had an impact on the intrinsic motivation of secondary school students in the third grade; on the other hand, the study sought to identify the exact influence of playing music on the different subscales of intrinsic motivation (enjoyment or interest, competency, freedom of choice and pressure or tension).

The results show that students were more motivated to participated in physical education classes with music than those without music. Playing music positively influences students' intrinsic motivation. Among students, this manifested itself mainly as an increased perception of enjoyment, more interest in the activity and a higher sense of competence. However, playing music does not appear to affect students' sense of choice or reduce the pressure or tension during PE class.

Thus, with a view to motivating students to engage in lifelong physical activity, which surely should be one of the main goals of every PE teacher, it is crucial that individuals are sufficiently intrinsically motivated from an early age during physical education classes. This study shows that music can have a beneficial effect on students' intrinsic motivation when participating in physical education classes. Thus, it is important for a PE teacher, when designing their physical education lessons, to consider integrating music each time.

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References

1. Waddington, I. Sport and Health: A Sociological Perspective. In *Handbook of Sports Studies*; SAGE Publications: Thousand Oaks, CA, USA, 2000; pp. 409–422. [CrossRef]
2. World Health Organization. *Global Action Plan for the Prevention and Control of Noncommunicable Diseases 2013–2020*; World Health Organization: Geneva, Switzerland, 2013.
3. World Health Organization. Obesity and Overweight. 2021. Available online: http://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight (accessed on 30 March 2023).
4. Vlaanderen, S. Vlaamse Monitor Sport en Bewegen. Available online: https://www.sport.vlaanderen/kennisplatform/thema-sportparticipatie/db-vlaamse-monitor-sport-en-bewegen/ (accessed on 30 March 2023).
5. Miranda, D. The role of music in adolescent development: Much more than the same old song. *Int. J. Adolesc. Youth* **2013**, *18*, 5–22. [CrossRef]
6. Papinczak, Z.E.; Dingle, G.A.; Stoyanov, S.R.; Hides, L.; Zelenko, O. Young people's uses of music for well-being. *J. Youth Stud.* **2015**, *18*, 1119–1134. [CrossRef]
7. Dearn, L. Young People and Popular Music Culture: The Impact of Popular Music within the Everyday Lives of Children Aged 10–16. Master's Thesis, University of York, York, UK, 2013.
8. De Frère, U. *Welk Effect Heeft Muziek op de Fysieke Activiteit van Studenten Middelbaar Onderwijs Tijdens de Lessen Lichamelijke Opvoeding? in Multidisciplinary Institute for Teacher Training (MILO)*; Vrije Universiteit Brussel: Brussels, Belgium, 2020.
9. Petruzzellis, L.; Chebat, J.-C.; Palumbo, A. *"Hey Dee-Jay Let's Play that Song and Keep me Shopping All Day Long". The Effect of Famous Background Music on Consumer Shopping Behavior*; Springer: Cham, Switzerland, 2015.

10. Milliman, R.E. The Influence of Background Music on the Behavior of Restaurant Patrons. *J. Consum. Res.* **1986**, *13*, 286–289. [CrossRef]
11. Engels, R.C.M.E.; Poelen, E.A.P.; Spijkerman, R.; Bogt, T.T. The effects of music genre on young people's alcohol consumption: An experimental observational study. *Subst. Use Misuse* **2012**, *47*, 180–188. [CrossRef]
12. Gangrade, A. The Effect of Music on the Production of Neurotransmitters, Hormones, Cytokines, and Peptides: A Review. *Music. Med.* **2012**, *4*, 40–43. [CrossRef]
13. Higginson, K.; Barney, D.; Prusak, K.; Wilkinson, C. The Effect of Music- and Video-Distraction on High School Physical Education Student Exercise Intensity. *Phys. Educ.* **2019**, *76*, 907–925. [CrossRef]
14. Tsang, E.C.K. A Comparison on the Effect of Doing Exercise, Listening to Music and Taking Quiet Rest on Mood Changes. *Asian J. Phys. Educ. Recreat.* **2011**, *17*, 37–44. [CrossRef]
15. Terry, P.C.; Karageorghis, C.I. Psychophysical effects of music in sport and exercise: An update on theory, research and application. In *Psychology Bridging the Tasman: Science, Culture and Practice, Proceedings of the 2006 Joint Conference of the Australian Psychological Society and the New Zealand Psychological Society, Auckland, New Zealand, 26–30 September 2006*; Australian Psychological Society: Melbourne, VIC, Australia, 2006.
16. Haluk, K.; Turchian, C.; Adnan, C. Influence of Music on Wingate Anaerobic Test Performance. *Ovidius Univ. Ann. Ser. Phys. Educ. Sport/Sci. Mov. Health* **2009**, *9*, 134.
17. Eliakim, M.; Meckel, Y.; Nemet, D. The Effect of Music during Warm-Up on Consecutive Anaerobic Performance in Elite Adolescent Volleyball Players. *Int. J. Sports Med.* **2007**, *28*, 321–325. [CrossRef]
18. Konukman, F.; Harms, J.; Ryan, S. Using Music to Enhance Physical Education. *J. Phys. Educ. Recreat. Dance* **2012**, *83*, 11–56. [CrossRef]
19. Barney, D.C.; Pleban, F.T. An Examination of Physical Education Teachers' Perceptions of Utilizing Contemporary Music in the Classroom Environment: A Qualitative Approach. *Phys. Educ.* **2018**, *75*, 195–209. [CrossRef]
20. Deutsch, J.; Hetland, K. The Impact of Music on Pacer Test Performance, Enjoyment and Workload. *Asian J. Phys. Educ. Recreat.* **2012**, *18*, 6–14. [CrossRef]
21. Brewer, L.; Barney, D.C.; Prusak, K.A.; Pennington, T. Effects of Music on Physical Activity Rates of Junior High School Physical Education Students. *Phys. Educ.* **2016**, *73*, 689–703. [CrossRef]
22. Barney, D.; Prusak, K.; Brewer, L. The Effects of Music on Student Step Counts and Time in Activity in College Basketball Activity Classes. *Fac. Publ.* **2018**, 2608. Available online: https://scholarsarchive.byu.edu/facpub/2608 (accessed on 30 March 2023). [CrossRef]
23. Barney, D.; Prusak, K. Effects of Music on Physical Activity Rates of Elementary Physical Education Students. *Phys. Educ.* **2015**, *72*, 236–244.
24. Barney, D.C.; Leavitt, T. A Qualitative Investigation of PE Teachers Perceptions of Introductory/Warm-up Activities in K-12 PE. *Phys. Educ.* **2019**, *76*, 86–97. [CrossRef]
25. Barney, D.; Christenson, R. Physical Education Majors Team Teaching in an Early Field Experience in a Junior High School Setting. *Asian J. Phys. Educ. Recreat.* **2009**, *15*, 16–21. [CrossRef]
26. Digelidis, N.; Karageorghis, C.; Papapavlou, A.; Papaioannou, A.G. Effects of Asynchronous Music on Students' Lesson Satisfaction and Motivation at the Situational Level. *J. Teach. Phys. Educ.* **2014**, *33*, 326–341. [CrossRef]
27. Ryan, R.M.; Deci, E.L. Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *Am. Psychol.* **2000**, *55*, 68. [CrossRef] [PubMed]
28. IBM Corp. *IBM SPSS Statistics for Windows*; IBM Corp.: Armonk, NY, USA, 2019.
29. Plant, R.W.; Ryan, R.M. Intrinsic Motivation and the Effects of Self-Consciousness, Self-Awareness, and Ego-Involvement: An Investigation of Internally Controlling Styles. *J. Personal.* **1985**, *53*, 435–449. Available online: https://psycnet.apa.org/doi/10.1111/j.1467-6494.1985.tb00375.x (accessed on 30 March 2023).
30. Ryan, R.M.; Koestner, R.; Deci, E.L. Ego-involved persistence: When free-choice behavior is not intrinsically motivated. *Motiv. Emot.* **1991**, *15*, 185–205. [CrossRef]
31. McAuley, E.; Duncan, T.; Tammen, V.V. Psychometric Properties of the Intrinsic Motivation Inventory in a Competitive Sport Setting: A Confirmatory Factor Analysis. *Res. Q. Exerc. Sport* **1989**, *60*, 48–58. [CrossRef]
32. McAuley, E.; Tammen, V.V. The Effects of Subjective and Objective Competitive Outcomes on Intrinsic Motivation. *J. Sport Exerc. Psychol.* **1989**, *11*, 84–93. [CrossRef]
33. Tsigilis, N.; Theodosiou, A. Temporal stability of the intrinsic motivation inventory. *Percept. Mot. Ski.* **2003**, *97*, 271–280. [CrossRef]
34. Karaoglanidis, D.; Mouratidou, K.; Kanellopoulos, P.; Karamavrou, S.; Parisi, I. Perceived autonomy, motivation climate and intention for physical activity. a comparative study of students based on their gender and educational level. *Facta Univ. Ser. Phys. Educ. Sport* **2020**, *18*, 25–36. [CrossRef]
35. Ghorbani, S.; Nouhpisheh, S.; Shakki, M. Gender Differences in the Relationship between Perceived Competence and Physical Activity in Middle School Students: Mediating Role of Enjoyment. *Int. J. Sch. Health* **2020**, *7*, 14–20. [CrossRef]

36. Cairney, J.; Kwan, M.Y.; Velduizen, S.; Hay, J.; Bray, S.R.; Faught, B.E. Gender, perceived competence and the enjoyment of physical education in children: A longitudinal examination. *Int. J. Behav. Nutr. Phys. Act.* **2012**, *9*, 26. [CrossRef] [PubMed]
37. Yurt, E. Examining high school students' academic amotivation. *Int. J. Curr. Educ. Stud.* **2022**, *1*, 51–63. [CrossRef]