Motivation and Emotion (2019) 43:705–718
https://doi.org/10.1007/s11031-019-09769-7

ORIGINAL PAPER

The Motivation for Learning Music (MLM) questionnaire: Assessing children's and adolescents' autonomous motivation for learning a musical instrument

Gilles Comeau[1,2] · Veronika Huta[3] · Yuanyuan Lu[2] · Mikael Swirp[2]

Published online: 26 April 2019

Abstract
The purpose of this study was to examine the psychometric properties and construct validity of The Motivation for Learning Music (MLM) questionnaire, designed to measure the autonomous motivation of young music students. Based on Self-Determination Theory (Deci and Ryan in Intrinsic motivation and self-determination in human behavior, Plenum, New York, 1985), the instrument consists of five subscales, each assessing a different type of motivation: intrinsic motivation, identification and integration, introjection, external regulation, and amotivation. We studied 337 child–parent pairs, with 257 of the children studying piano, and 80 studying violin. The children were age 6–17. The item pool was administered to the children, and various construct validation measures were administered to the children and/or their parents. For the final MLM, we selected 5 items per subscale, based on their psychometric properties and a desire to adequately cover each content domain. Each subscale formed a distinct component in principal components analysis; the questionnaire performed well in confirmatory factor analysis; the inter-correlations of the subscales had a consistent simplex pattern; and all subscales had alphas above .80.

Keywords Motivation · Music lessons · Music instrumental pedagogy · Self-determination theory

Introduction

Music-making enriches the lives of countless people all over the world, and children continue to pursue music lessons in great numbers. Understanding the factors that influence children's motivation to take music lessons is of great interest to parents and educators hoping to create the conditions to foster a love of music and the work ethic and cultural enrichment that musical training brings (Brown 2012; Comeau et al. 2015; Cutietta 2003; Dai and Schader 2001; The Royal Conservatory of Music 2014). Usually a child's parents initiate the study of a musical instrument (Comeau and Huta 2015; Donnat 1996), and for a while, the motivation of the young student is supported by the parents and the novelty of the activity (Davidson et al. 1995). However, after the initial excitement has dissipated, many parents are faced with resistance as their children realize that it takes time and effort to reach instrumental mastery (McPherson 2000). Some students overcome this, maintaining a high degree of autonomous motivation, while other students lack motivation and can easily abandon their music-making endeavours. However, it should also be pointed out that extrinsic motivation may also have links with competence and persistence, thus calling into question the hypothesis that only autonomous motivation can generate the best results (Renwick and McPherson 2009; Valenzuela et al. 2018).

Motivation is one of the most important elements that influences a person's success in attaining a high level of proficiency at any skill or activity, as it directly influences the intensity of effort exerted in pursuing and mastering that skill (Weinberg and Gould 1995). Specifically in the case of learning a musical instrument, research has shown that students who are autonomously motivated are more likely

✉ Gilles Comeau
gcomeau@uottawa.ca

1 School of Music, Piano Pedagogy Research Laboratory, University of Ottawa, 50 Perez Hall, Ottawa, ON K1N 6N5, Canada

2 Piano Pedagogy Research Laboratory, University of Ottawa, Ottawa, ON, Canada

3 School of Psychology, University of Ottawa, Ottawa, ON, Canada

to engage with the music itself, play as a vehicle of personal pleasure, and continue playing over the long term (Evans et al. 2013; King 2016; Pitts et al. 2000), while a lack of motivation may lead to dropping out, which is often frustrating to parents, and a cause of regret later in the child's life (King 2016; Pitts et al. 2000). Thus, it is a common theme among music educators to seek to understand why certain students perceive themselves as being genuinely motivated for music lessons while others do not.

Of the many theoretical perspectives that have been proposed to better understand motivation, the self-determination theory (SDT) proposed by Deci and Ryan (1985) has grown in importance and popularity over the last decades. This comprehensive theory holds the potential to contribute significantly to our understanding of the issues related to motivation and music learning. Therefore we have developed and validated the Motivation for Learning Music subscales based on SDT to address the need to assess music students' level of motivation in both research and practice.

Self-determination theory

Ryan and Deci's (2000a, b) SDT emphasizes the importance of measuring not only the degree of motivation but also the type of motivation. The theory differentiates between autonomous motives (where the source of motivation is primarily within the person, and consists of genuine self-authored values, goals, interests, or enjoyment), controlled motives (where the source of motivation is to some degree external to the true self, and consists of external or internal pressure), and *amotivation* (a lack of any motivation, purpose, or rationale for an activity, or a dysregulation process coming from a subjective perspective of difficulties that make it impossible to reach an optimal experience of motivation creating a form of disconnection between intentional action and expected outcome).

Autonomous motives can be further differentiated into several types of motivation. From most to least autonomous, these are: *intrinsic motivation* (being freely motivated for an activity out of pure interest and enjoyment, as an end in itself rather than a means to an end); *integration* (being motivated for an activity because it aligns with one's sense of identity); and *identification* (being motivated for an activity because it aligns a personal value or goal).

Controlled motives can be further differentiated into several types of motivation. From most to least autonomous, these are: *introjection* (being motivated to do an activity through internal pressures, such as self-imposed guilt, shame, or anxiety, believing that one 'ought' to do it, or believing that one's self-esteem depends on it), and *external regulation* (being motivated to do an activity through external pressures, such as avoid punishment, disapproval by someone else, perceived detriment for oneself, get a reward or approval from someone else or perceived gain for oneself).

Of course, all of these types of motivation can be assessed at the same time, making it possible to study people who have various combinations of motives, such as high scores on both autonomous and controlled motives (Wiersma 1992).

Autonomous forms of motivation have been associated with a variety of positive outcomes, including greater persistence (Ryan and La Guardia 2000; Vallerand and Bissonnette 1992), higher quality of engagement (Ryan and Deci 2000a; Connell and Wellborn 1990), willingness to work harder to improve skills (Wigfield et al. 2004), better learning outcomes (Ryan and Deci 2009), better performance (Miserandino 1996; Ryan and La Guardia 2000), and more positive self-perceptions and greater well-being (Ryan and Deci 2009). In contrast, controlled motives have often been associated with negative outcomes, such as decreased interest and effort (Ryan and Deci 2000b), and decreased well-being (Ryan and Deci 2009).[1]

The primary objective of the present paper was to develop and validate the Motivation for Learning Music (MLM) questionnaire, a measure of motivation based on SDT for young students taking music lessons. Before proceeding to detail our methods and results when developing the MLM, we first summarize the development of the two precursors of the MLM. These previous versions were used to answer specific research questions presented in earlier papers, however, as explained below, some shortcomings compelled us to continue to modify the subscales in order to get stronger validity.

The initial version of the motivation questionnaire

The development of the initial questionnaire consisted of two phases. In the first phase, focus groups were conducted with piano students (9 children, 12 teenagers), 15 piano students' parents, and 12 piano teachers to generate a pool of reasons for why students engage in music lessons. We asked for their opinion on why children enroll in piano lessons, what children find interesting or boring, the factors that lead a student to abandon piano studies, and other related topics. The responses were audio-recorded, and we extracted a

[1] There is research on SDT in many domains, such as medicine and health care (Ryan et al. 1995; Williams et al. 1998), education (Cokley 2000; Deci et al. 1991; Ryan and Connell 1989; Vallerand and Bissonnette 1992; Vallerand et al. 1989), sports (Kavussanu and Roberts 1996; Kim and Gill 1997; Mitchell 1996; Pelletier et al. 1995a), the workplace (Deci et al. 2001), leisure (Pelletier et al. 1995b), interpersonal relationships (Blais et al. 1990), life aspirations (Kasser and Ryan 2001; Williams et al. 2000), parenting (Grolnick et al. 1997), and religion (Ryan et al. 1993).

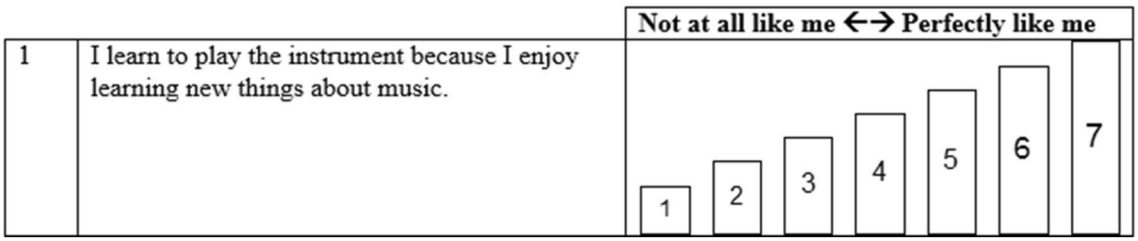

Fig. 1 Sample item from the Motivation for Learning Music (MLM) scale

Table 1 Cronbach's alphas and descriptives for the initial, revised, and final motivation scales

	Likert scale	Initial scales		Revised scales		Final scales: Motivation for Learning Music (MLM)						
		# Items	Alpha	# Items	Alpha	# Items	Alpha	IIC	Mean	SD	Sk	Rku
Amotivation	1–7	10	.80	6	.82	5	.85	.54	1.92	1.23	1.60	1.86
External regulation	1–7	10	.65	3	.68	5	.87	.58	3.06	1.74	.61	− .60
Introjection	1–7	10	.61	2	.64	5	.87	.57	3.23	1.77	.43	− .86
Identification and integration	1–7	10	.84	2	.83	5	.82	.48	4.49	1.51	− .44	− .51
		10	.86									
Intrinsic motivation	1–7	10	.91	5	.86	5	.85	.54	5.74	1.18	− 1.01	.28

IIC mean inter-item correlation, *Sk* skewness, *Rku* kurtosis

list of the more frequently cited themes. Then, we assigned each theme to one of six types of motivation identified in Self-Determination Theory (Ryan and Deci 2000a, b)—amotivation, external regulation, introjection, identification, integration, and intrinsic motivation. Finally, we formulated specific items to reflect the themes, for a total of 10 items for each type of motivation.

The items representing different types of motivation were intermixed on the questionnaire. A seven-point Likert-type scale was used, in which the child had to rate each statement from 1 (not at all like me) to 7 (perfectly like me). Since the Likert-type scale might seem very abstract for young children, we provided a visual aid as shown in Fig. 1.

The initial version of the questionnaire was tested in 50 piano students aged 7–15 (Desrochers et al. 2006). The motivation questionnaire was administered as part of a larger package of questions called the Survey of Musical Interests. Part of the Survey of Musical Interests was completed by the piano student, and the other part was completed by one of the student's parents, for a total of 50 child–parent pairs. Note that the name of the final questionnaire, "Motivation for Learning Music (MLM)", is being introduced in the current paper; in previous publications, the motivation questionnaire was called the Piano Autonomous Motivation Scale (Comeau and Huta 2015; Comeau et al. 2015), or simply described as part of the larger Survey of Musical Interests (Desrochers et al. 2006).

The study on the initial version of the questionnaire showed that children of all ages were able to understand the rating scale and the wording of most items. The correlations between the six subscales largely showed a simplex pattern, though several correlations were excessive (with a magnitude around .7), and introjection had overly large positive correlations with identification, integration, and intrinsic motivation (with magnitudes around .6 or .7). In addition, some of the Cronbach's alphas of the subscales were as low as .61, as shown in Table 1.

The revised version of the motivation questionnaire

In a new sample of 173 piano students aged 6–16, a Principal Components Analysis was performed on the 60-item initial questionnaire (Comeau and Huta 2015). Items were dropped if they failed to load primarily on the concept that they were intended to represent. We also merged the identification and integration items into a single subscale, since we found it difficult to empirically differentiate between them. This resulted in a revised 5-subscale version of the questionnaire, with a total of 18 items (shown in "Appendix" section).

On the revised questionnaire, the correlations between the five subscales consistently showed a simplex pattern; none of the correlations was excessive (at most around .5); and introjection had reasonable positive correlations with identification and integration and with intrinsic motivation (around .3 or .4). However, some of the Cronbach's alphas of the subscales were still as low as .64, as show in Table 1. In addition, the number of items per subscale was no longer

the same, ranging from 2 to 6. Furthermore, we wished to see if the subscales could be used more generally, in students studying an instrument other than the piano. This is what led us to revise the subscales a final time, as presented in this paper.

Construct validation of the final version of the questionnaire: Predicted links with other variables

In the present paper, in addition to examining the psychometric properties of the final version of the MLM questionnaire, we wished to perform construct validation. When selecting variables to serve as correlates, we tried to include concepts which were quite proximally intertwined with motivation (e.g., alternative or indirect ways of assessing motivation, or proximal causes or outcomes that are evident on a daily/regular basis), rather than concepts that were more distal predictors or outcomes of motivation (e.g., musical performance, or age at which lessons started). Although we assign thematic headings to the construct validation variables, such as "External/internal pressure for practice/lessons" under Hypothesis 1, the more precise content of the variables is captured in the names of the operationalizations, such as "child's report of doing practice/lessons only when forced by others/self".

Hypothesis 1: External/internal pressure for practice/lessons Pressure (operationalized as the child's report of doing practice/lessons only when forced by others/self) will relate positively to amotivation, external regulation, and introjection, and negatively to identification/integration and intrinsic motivation.

Rationale for Hypothesis 1 An amotivated music student often lacks motivation for learning the instrument, and thus is more likely to practice or attend lessons when influenced by external pressure. An externally regulated or introjected music student is sensitive to, and thus motivated by, some form of pressure. Identification/integration and intrinsic motivation involve a direct personal valuing of the activity, and pressure is likely to interrupt and draw attention away from this personal relationship with the activity.

Hypothesis 2: Receiving tangible rewards for practice/achievement Tangible rewards (operationalized as the parent's report of giving tangible rewards to the child for home practice and for musical achievement) will relate positively to external regulation and negatively to intrinsic motivation.

Rationale for Hypothesis 2 Previous theory and research in SDT indicates that receiving tangible rewards for an activity—such as money, treats, or gifts—should shift a person's motivation away from intrinsic motivation and toward external regulation, such that the person loses spontaneous interest in the activity and instead becomes "hooked on" continuing to receive the tangible rewards (Comeau and Huta 2015; Deci et al. 1999).

Hypothesis 3: Diligence when practicing Diligence (operationalized as the parent's report of total minutes of child's weekly instrument practice, and the child's report of interest in the mundane aspects of instrument practice such as playing scales and playing with a metronome) will relate positively to external regulation, introjection, identification/integration, and intrinsic motivation, and negatively to amotivation.

Rationale for Hypothesis 3 Previous research has shown that external regulation, introjection, identification, integration, and intrinsic motivation can all increase the quantity of time dedicated to an activity or the quantity of work produced, presumably because they all provide the individual with some sort of motivation (though only the autonomous types of motivation tend to relate to the quality of the work produced); in contrast, amotivation has been linked with a decrease in the quantity of time dedicated or work produced (Deci et al. 1999; Jenkins et al. 1998).

Hypothesis 4: Long-term commitment to lessons/playing Long-term commitment (operationalized as the parent's estimate of probability that the child will play as an adult, and the parent's and child's estimates of how long the child will continue to take lessons) will relate positively to external regulation, introjection, identification/integration, and intrinsic motivation, and negatively to amotivation.

Rationale for Hypothesis 4 Previous research with a brief form of the initial version of the motivation questionnaire has shown that children who dropped out of piano lessons scored higher on amotivation, lower on autonomous motives, and lower on external regulation and introjection than children who remained in lessons (Gerelus et al., submitted). Similarly, Gagné et al. (2008) studied autonomous motivation, introjected motivation, and external regulation, and found that all three could relate positively to workplace commitment.

Hypothesis 5: Persistence when musical activities are optional Persistence in optional music activities (operationalized as the parent's report of how often the child participates in music camp, master classes, and ensembles, the child's report of interest in creative composing and improvising, and the child's report of seeking to play beyond practice sessions) will relate positively to intrinsic motivation and identification/integration, and negatively to amotivation.

Rationale for Hypothesis 5 The concept of persistence differs somewhat from the concept of long-term commitment addressed in Hypothesis 4. Persistence involves engaging in more of an activity than one is strictly asked to do. While commitment has related positively to autonomous motivation, introjection, and external regulation, persistence in learning contexts has only related positively to autonomous motivation and introjection, but has been unrelated to external regulation (Guay et al. 2008). When it comes to amotivation, we would expect a negative relationship with doing more of an activity than one has to.

Method

Participants

Participants were 337 child–parent pairs. Each child had been taking music lessons for at least .5 years. Of the music students, 257 had been taking piano lessons, and 80 had been taking violin lessons. The children completed the Motivation in Learning Music questionnaires as well as some of the construct validation measures, and the child's parent completed the remaining construct validation measures, as detailed below.

Within the piano student group, the children were aged 6–17 with a mean age of 10.85 years (SD = 2.63), and 62% were female. The starting age for piano lessons was between 2 and 15 (M = 6.50, SD = 2.21), and the number of years of lessons ranged between .5 and 13.5 (M = 4.35, SD = 2.68). The sample of piano students came from 107 different piano teachers.

Within the violin student group, the children were aged 4–16 with a mean age of 10.40 years (SD = 2.66), and 63% were female. The starting age for violin lessons was between 2 and 15 (M = 5.58, SD = 1.90), and the number of years of lessons ranged between .5 and 10.0 (M = 4.83, SD = 2.44). The sample of violin students also comes from a large number of different teachers (56), to obtain as diverse a sample as possible.

Some participants were recruited by contacting music teachers, often via various music teachers' associations. Teachers were asked to distribute invitation letters to their students, and gain permission to forward the parents' contact information to the researcher. Other parents were invited to participate in the study while their children were attending summer music institutes.

Procedure

The children were assessed before or after a music lesson or at a scheduled research session. Participants were assessed by a trained assistant, either individually (the younger ones) or in a group setting (the older ones) where several participants did the survey at the same time and place, but independently (i.e., they did not respond together as a group. To obtain the most authentic responses from children, their parents were not present while children were completing their questionnaires. The children were assured that neither their parents nor their music teachers would have access to their completed questionnaires. All participants were told that there were no right or wrong answers; they were asked to simply express their own views by circling the appropriate numbers. At the beginning of each child's assessment, the trained assistant provided both written and verbal instructions about the items on the questionnaire. The children were encouraged to raise any questions, concerns, or difficulties they had at any time during the assessment. With the younger children, the assistants explained items one by one and let the participants answer before moving on to the next item.

Measures

Item pool for deriving the final Motivation for Learning Music (MLM) questionnaire

We started with the 18 items from the revised questionnaire, rewording the two introjection items slightly to make them clearer ("because I would be ashamed if I stopped playing" was revised as "because I would be ashamed of myself if I stopped playing"; "because I would feel bad if I didn't learn to play the piano/violin" was revised as "because I would feel bad about myself if I didn't learn to play the piano/violin").

Of the authors of this paper, one is an expert in piano pedagogy (e.g., Comeau 2015, 2017), and the other has expertise in self-determination theory (e.g., Ryan et al. 2008). The authors generated an additional 21 items, with the aims of arriving at subscales with the same numbers of items, raising the internal consistencies of the subscales—especially the introjection and external regulation subscales which had alphas below .80 in the revised questionnaire—and adequately covering the conceptual territory of each type of motivation. Therefore, the initial item pool for the present study consisted of 39 items.

We also adapted the piano subscales for violin students by slightly altering the wording. The root question "I take piano lessons because …" became "I take music lessons because…". And items like "but I don't care if I play piano or not" and "because playing the piano is a lot of fun" became "but I don't care if I play violin or not" and "because playing the violin is a lot of fun".

Table 2 Cronbach's alphas and descriptives for the construct validation measures

	Likert Scale	# Items	Alpha	Mean (median)	SD	Sk	Rku
Child's report of doing practice/lessons only when forced by others/self	1–7	6	.73	3.02	1.34	.47	− .42
Parent's report of giving tangible rewards to child for home practice	1–5	1	–	1.97	1.17	.94	− .15
Parent's report of giving tangible rewards to child for musical achievement	1–5	1	–	2.41	1.34	.44	− 1.07
Parent's report of minutes of child's weekly instrument practice	–	1	–	172.98 (135.00)	145.09	2.48	7.87
Child's report of interest in the mundane aspects of instrument practice	1–7	8	.79	4.28	1.35	− .15	− .57
Parent's estimate of probability that child will continue playing as an adult	1–5	1	–	3.58	1.09	− .33	− .79
Parent's report of how much child participates in optional music activities	1–5	3	.67	1.20	1.03	.91	− .02
Child's report of interest in creative composing and improvising	1–7	4	.81	5.06	1.61	− .69	− .35
Child's report of seeking to play beyond practice sessions	1–7	5	.76	4.26	1.42	− .08	− .77

Sk skewness, *Rku* kurtosis

Construct validation measures

For each construct validation measure, Table 2 shows the Likert scale, number of items, Cronbach's alpha, mean, standard deviation, skew, and kurtosis.

Each construct validation measure is detailed below.

External/internal pressure for practice/lessons This concept was operationalized as the child's report that the child does practice/lessons only when forced by others/self. The instructions were "I would like you to tell me how much these actions resemble things you do as a piano/violin student." The 6 items which made up this scale were "I practice only when my parents make me", "I force myself to practice", "I never practice longer than I'm supposed to", "I often find excuses not to practice", "My parents make me go to piano/violin lessons", and "I often watch the clock when I practice". The items were rated from 1 (not at all like me) to 7 (perfectly like me).

Receiving tangible rewards for practice/achievement This concept was operationalized using two items completed by the parent: "Do you (or your spouse) offer your child material rewards or privileges for home practices?" and "Do you (or your spouse) offer your child material rewards or privileges for achievements or milestones at the piano/violin (e.g., lessons, performance at a concert, competition, exam, completing a certain level)?" The items were rated from 1 (never) to 5 (always). The two items together had a Cronbach's alpha of only .63, and thus we analyzed them separately.

Diligence when practicing This concept was operationalized in two ways. First, the parent completed the following two items: "This year, on average, how many days a week does your child practice the piano/violin? On average my child practices _____ days per week"; and "This year, on average, how long is each practice session? On average each practice session is _____ minutes." The reported values for these two items were multiplied together, to arrive at a measure of the total number of minutes per week the child practiced their instrument.

Second, the child completed an 8-item scale developed by Comeau et al. (2015), which reflects the child's interest in the "mundane" challenging aspect of instrument practice. The instructions were "I would like to know how interesting these different things are to you." Sample items are "practicing scales", "repeating a bar that needs practice", and "playing with a metronome". The items were rated from 1 (not interesting at all) to 7 (very interesting).

Long-term commitment to playing The parent completed the following item: "In your opinion, do you think your child will continue to play the piano/violin (somewhat regularly) as an adult?", rated from 1 (not likely) to 5 (absolutely).

Freely chosen optional music activities This concept was operationalized in several ways. First, parents completed a 3-item scale, where the items were "Does your child attend summer music camps?", "Does your child attend master classes or workshops?", and "Does your child participate in any kind of collective music-making for piano/violin, such as duets, accompanying other performers, small ensemble, etc.?" The items were rated from 1 (never) to 5 (always).

In addition, the child's creativity with their musical instrument was assessed with a 4-item scale completed by the child. The instructions were "I would like to know how interesting these different things are to you." The items were

"Improvising", "Composing music", "Composing a piece of music", and "Making up my own music". The items were rated from 1 (not interesting at all) to 7 (very interesting).

Finally, the child reported how often they seek to play their instrument beyond practice sessions, with a 5-item scale. The instructions were "I would like you to tell me how much these actions resemble things you do as a piano/violin student." The items were "I often spend free time playing around on the piano/violin", "When I am away from home I look for a piano/violin I can play", "I play pieces I know just for the fun of it", "I would play the piano/violin all day if I could", "I make a point of making some time for music every day". The items were rated from 1 (not at all like me) to 7 (perfectly like me).

Analyses

Given that some measures were not normally distributed, correlations between variables are reported as Spearman correlations.

Furthermore, for the 337 music students, there were a total of 165 different music teachers; 112 of the teachers had only one of their students participating in the study, and 33 teachers had at least 3 of their students participating in the study. We found that the Intraclass Correlation of each of the motivation subscales was below .005. Thus, there was no concern about underestimated p values in the case of inter-correlations between the motivation subscales. However, the Intraclass Correlation exceeded .05 for most of the variables used to test construct validity. Thus, for the analyses correlating the motivation subscales with the construct validation measures, we could either perform Hierarchical Linear Modeling with a sample size of 33 (since only the data from teachers with 3 or more students could be used), or we could perform correlations on a sample size of 165 after randomly selecting only one student per teacher; we chose the latter option for greater power.

For selecting items out of an initial item pool, Principal Components Analysis was used. The final selection of items was then tested with Confirmatory Factor Analysis.

Results

Combining the piano and violin students

All analyses other than confirmatory factor analysis were performed using SPSS version 25. The piano and violin students did not differ in gender or age. Only five of the items in the 39-item pool showed a statistically significant difference between piano and violin students, and the items were from four different subscales. Most inter-correlations of the final subscales did not differ in the two samples (except for the correlation between amotivation and intrinsic motivation, which was significantly less negative in violins students). There were quite a few differences between piano and violin students in terms of the construct validation variables (compared to piano students, violin students received tangible rewards more often for practicing, practiced more minutes per week, expected to continue taking lessons longer, were expected to continue taking lessons longer by their parents, participated in more optional music activities, and were less likely to play when not practicing, and were less interested in composing and improvising). However, the strengths of relationships between the construct validation variables and the final motivation subscales differed across the two groups in only 4% of analyses, which did not differ much from the rate expected by chance (amotivation and interest in composing and improvising correlated more negatively in violins; identification and interest in composing and improvising correlated more positively in violins; intrinsic motivation and parent's estimate of probability that child will continue playing as an adult correlated less positively in violins).

Overall, therefore, we judged the piano and violin student samples to be similar enough to be combined for the remaining analyses in this paper.

Principal components analyses of the motivation items

Beginning with the 39 items, a series of Principal Components Analyses (PCAs) were performed on the motivation items to remove poorly performing ones, each time using Direct Oblimin rotation with Delta = 0. We ran PCAs, rather than Exploratory Factor Analyses, because we believe that each type of motivation consists of all the variance represented by the items used to assess it, including the unique variance contributed by each item, and not only the covariance that items share. A given item was removed if: it did not load primarily on the factor it was intended to represent, it failed to load above .35 on any factor, or it was one of only one or two items loading above .35 on a given factor.

In the final PCA, there were 5 eigenvalues above 1, and the scree plot also indicated a 5-factor solution. We therefore extracted 5 factors, which together explained 65% of the total variance. The factors were labeled as: *amotivation* (e.g., lack of interest, rationale, desire), *external regulation* (e.g., avoid disappointing parents/teacher), *introjection* (e.g., avoid anxiety, guilt, shame), *identification/integration* (e.g., desire to be a musician, desire to be able to play every day), and *intrinsic motivation* (e.g., for enjoyment, for interest).

Table 3 Factor loadings of final motivation scale items in principal components analysis with direct Oblimin rotation (Delta = 0)

	Factor number				
	III	IV	II	V	I
I learn to play the piano/violin…					
Amotivation					
But I don't care if I play piano/violin or not*	**.83**	.00	− .02	− .03	.18
But I don't see the point in learning to play the piano/violin*	**.82**	.00	.01	− .01	.00
But I don't want to do it*	**.69**	.03	− .03	.01	− .22
But I am not interested in it*	**.68**	.06	− .06	− 04	− .21
But it is a waste of my time*	**.62**	.08	.08	− .02	− .18
External regulation					
Because my teacher would be disappointed if I stopped playing*	− .08	**.90**	− .03	.04	.02
Because my parents would be upset if I quit playing the piano/violin*	.03	**.85**	.03	.03	.00
Because my parents would be disappointed if I stopped playing*	.14	**.76**	.00	− .01	.05
Because my teacher would be upset with me if I stopped	− .03	**.72**	.21	.02	− .09
Because I will get in trouble if I don't	.23	**.39**	.33	− .11	− .09
Introjection					
Because I would feel embarrassed if I stopped	− .04	− .08	**.92**	− .04	− .01
Because I would be ashamed of myself if I stopped playing*	− .06	.06	**.80**	.04	− .04
Because I would feel bad about myself if I didn't learn to play the piano/violin*	− .10	.06	**.77**	.02	.01
Because I would feel anxious if I didn't	.10	− .01	**.74**	.10	.12
Because I would feel guilty if I don't	.08	.11	**.73**	− .08	− .01
Identification and integration					
Because I want to be a musician when I grow up*	− .04	− .10	.01	**.85**	− .12
Because I see myself as a musician*	− .01	− .02	.02	**.83**	.00
Because this is what a musician does	.10	.20	− .02	**.73**	.10
Because I made the decision to become a good piano/violin player	− .20	.01	.05	**.49**	.29
Because this is part of who I am	− .29	.03	.01	**.38**	.27
Intrinsic motivation					
Because I enjoy learning new pieces*	− .05	.14	− .09	− .09	**.85**
Because playing the piano/violin is a lot of fun*	.09	− .14	.08	.07	**.73**
Because I enjoy learning new things about music*	− .19	.03	.03	− .00	**.73**
Because it is really interesting	− .18	.02	.04	.12	**.68**
Because it makes me feel good*	.05	− .13	.11	.19	**.63**

Loadings of at least .35 are in bold

*Items on the revised scales

Psychometric characteristics of the final MLM subscales

The items on the final subscales, along with their factor loadings, appear in Table 3 as well as "Appendix" section which shows the changes made to the 18 items used in the previous version of the subscales.

The Cronbach's alpha, mean inter-item correlation, mean, standard deviation (SD), skew, and kurtosis of each final subscale appear in Table 1. All alphas were above .80. The mean inter-item correlations were at the upper end of the moderate range, but not so high as to suggest a mere rewording of the item content. Most subscales were reasonably normally distributed, though amotivation showed substantial skew and leptokurtosis. In our remaining analyses in this paper, therefore, we used Spearman correlations.

As shown in Table 4, the Spearman correlations between the final subscales showed a good simplex pattern, with subscales increasingly far apart on the motivation spectrum having less and less positive correlations.

Confirmatory factor analysis of the final MLM subscales

We then performed a Confirmatory Factor Analysis (CFA) using the AMOS version 25, to test the stringent assumption that all items could be constrained to have zero cross-loadings and the model would still fit the data.

Table 4 Correlations between the final motivation scales

	Amotivation	External regulation	Introjection	Identification and integration	Intrinsic motivation
Amotivation	1	.40**	.09	− .41**	− .49**
External regulation	.38	1	.57**	− .06	− .17**
Introjection	.00	.65	1	.24**	.15**
Identification and integration	− .64	− .07	.29	1	.61**
Intrinsic motivation	− .71	− .12	.22	.81	1

Above the diagonal are Spearman correlations between the scales as they would be used in research (i.e., scales where each item is equally weighted). Below the diagonal are the correlations between latent factors obtained in Confirmatory Factor Analysis

**$p < .01$

Table 5 Spearman correlations testing the construct validity of the final motivation scales

	Amotivation	External regulation	Introjection	Identification integration	Intrinsic motivation
External/internal pressure for practice/lessons					
Child's report of doing practice/lessons only when forced by others/self	.62**	.50**	.15†	− .29**	− .43**
Receiving tangible rewards for practice/achievement					
Parent's report of giving tangible rewards to child for home practice	− .04	.22**	.06	.11	.03
Parent's report of giving tangible rewards to child for musical achievement	− .04	.25**	.12	.09	.06
Diligence when practicing					
Parent's report of minutes of child's weekly instrument practice	− .26**	.01	− .04	.18*	.06
Child's report of interest in the mundane aspects of instrument practice	− .36**	− .07	.21**	.53**	.53**
Long-term commitment to playing					
Parent's estimate of probability that child will continue playing as an adult	− .45**	.00	.19**	.18**	.21**
Freely chosen optional music activities					
Parent's report of child participation in camps, workshops, collective music-making	− .20**	.08	.01	.14†	.03
Child's report of interest in creative composing and improvising	− .04	− .01	.12	.28**	.35**
Child's report of seeking to play beyond practice sessions	− .34**	− .11	.25**	.45**	.61**

†$p < .10$, *$p < .05$, **$p < .01$

Almost all of the standardized factor loadings were .6 or greater, with none dropping below .57, indicating that the items were strongly associated with their corresponding factors. All of the global fit indices were in the adequate to good range: CMIN = 618.68, df = 265, CMIN/df = 2.34, CFI = .92, TLI = .91, RMSEA = .06, 90% CI of RMSEA .06 to .07, SRMR = .07. The correlations between the latent factors are given below the diagonal in Table 4. The correlations showed a consistent simplex pattern.

Construct validation of the final MLM subscales

Table 5 shows the Spearman correlations between the final subcales and the variables we used to assess construct validity. These variables were formulated for the initial version of the subscales by focus groups of pedagogy experts and experienced music teachers. The selected measures were also found in pedagogy text books as important elements or characteristics associated with

motivation (Baker-Jordan 2004; Klingenstein 2009; Parker 2006; Uszler et al. 2000).

Hypothesis 1: External/internal pressure for practice/lessons We had predicted that pressure would relate positively to amotivation, external regulation, and introjection, and negatively to identification/integration and intrinsic motivation. This hypothesis was supported as predicted. In fact, the pattern of correlations showed a consistent simplex pattern, with the most positive correlation for amotivation and the most negative correlation for intrinsic motivation.

Hypothesis 2: Receiving tangible rewards for practice/achievement We had predicted that tangible rewards would relate positively to external regulation and negatively to intrinsic motivation. As predicted, external regulation correlated positively with both indices of tangible rewards. However, intrinsic motivation was unrelated to either index of tangible rewards.

Hypothesis 3: Diligence when practicing We had predicted that diligence would relate positively to external regulation, introjection, identification/integration, and intrinsic motivation, and negatively to amotivation. As predicted, both indices of diligence related positively to identification/integration and negatively to amotivation. However, only one index of diligence (child's report of interest in the mundane aspects of instrument practice) related to introjection and intrinsic motivation, while the other index did not (parent's report of minutes of child's weekly instrument practice). Furthermore, external regulation was unrelated to either index of diligence.

Hypothesis 4: Long-term commitment to lessons/playing We had predicted that commitment would relate positively to external regulation, introjection, identification/integration, and intrinsic motivation, and negatively to amotivation. As predicted, all three indices of commitment related positively to identification/integration and intrinsic motivation, and negatively to amotivation. However, introjection related to only one index of commitment (parent's estimate of probability that child will continue playing as an adult), and external regulation related to none of them.

Hypothesis 5: Persistence when musical activities are optional We had predicted that persistence at optional music activities would relate positively to intrinsic motivation, identification/integration, and introjection, and negatively to amotivation. This hypothesis was largely supported, with a few exceptions: there was no relationship between collective music-making and both intrinsic motivation and introjection; and there was no relationship between composing/improvising and both amotivation and introjection. For the most part, the child's report of seeking to play beyond practice sessions showed a simplex pattern, such that it correlated most positively with intrinsic motivation and most negatively with amotivation.

Discussion

The objective of this study was to develop and validate a measure of autonomous motivation for children and adolescents who are taking music lessons, called the Motivation for Learning Music (MLM) questionnaire. The questionnaire was based on Deci and Ryan's (1985) self-determination theory (SDT), which postulates different types of motivation that are classified along a continuum of increasing autonomy: amotivation, external regulation, introjection, identification/integration, and intrinsic motivation.

The final MLM questionnaire consisted of 5 subscales with 5 items each. The 25 items formed 5 factors, with the items loading as predicted, and thus confirmed the distinctness of the different types of motivation in the music domain. Each subscale had a Cronbach's alpha above .80, and thus had good internal consistency. Four of the motivation subscales were reasonably normally distributed, though amotivation showed substantial skew and leptokurtosis, suggesting the need for non-parametric analyses or transformation prior to parametric analyses when using this subscale. The five subscales had inter-correlations showing a consistent simplex pattern, and thus conformed to the SDT prediction that they should fall along a motivation continuum from least to most autonomous.

Correlations between MLM subscales and other variables showed good construct validation, and even where results did not conform to predictions, most were interpretable in light of additional considerations based on SDT.

First, a measure of external/internal pressure for practice/lessons showed a consistent simplex pattern, correlating most positively with amotivation and most negatively with intrinsic motivation. In contrast, a measure of freely choosing to play beyond practice sessions showed a consistent simplex pattern in the other direction, correlating most positively with intrinsic motivation and most negatively with amotivation. These two findings were important, as they directly confirmed the SDT argument that the specific content of the different types of motivation (e.g., "I don't see the point", "my parents would be disappointed if I stopped", "I would feel guilty if I don't", "I see myself as a musician", "I enjoy it") is underpinned by an increasing state of pressure toward the amotivated/controlled end of the continuum, and an increasing state of free choice toward the autonomous end of the continuum (Deci and Ryan 2000).

Second, the indices of tangible rewards were positively correlated with external regulation, which was consistent

with previous theory and findings that tangible rewards shift peoples' motivation toward external regulation, such that the person begins to see the activity as a means to receive rewards rather than an end in itself. This result was all the more compelling given that the measure of motivation was completed by the child, whereas the measures of reward-giving were completed by the parent. However, unlike previous theory and studies, we did not find evidence to suggest that tangible rewards undermined intrinsic motivation. Perhaps, in the music education domain, giving tangible rewards is less of a cause of the child's type of motivation than a consequence, i.e., reward-giving might be the parent's reaction to a child who is particularly responsive to rewards.

Third, at least one of the two indices of diligence was negatively related to amotivation and positively related to introjection, identification/integration, and intrinsic motivation. This was consistent with our prediction that any form of motivation, whether autonomous or controlled, can influence the quantity of work done (if not the quality of that work). Interestingly, while the parent's report of minutes of child's weekly instrument practice related to identified/integrated motivation, it did not relate to intrinsic motivation. Some previous work in SDT is congruent with this finding. Performing arduous tasks has sometimes been related to identified/integrated but not intrinsic motivation, presumably because such tasks are not immediately enjoyable and require the fuel of personal values and sense of identity (Losier and Koestner 1999; Niemiec and Ryan 2009). Unexpectedly, external regulation was unrelated to either index of diligence. It's understandable that a desire to avoid disappointing one's parents or teacher may not necessarily translate into a private interest in the mundane aspects of piano practice. But the absence of a link with amount of time spent practicing is harder to explain. Perhaps the result hinged on the wording of the external regulation items, which focused on disappointing one's parents/teacher if one stopped playing altogether, not if one lacked in diligence.

Fourth, we studied the expectations of the parent and of the child that the child would continue taking lessons and playing their instrument in the future. We hypothesized that long-term commitment would relate negatively to amotivation, and positively to both autonomous and controlled motives. We did find that the indices of long-term commitment related negatively to amotivation and positively to autonomous motives; however, they did not relate to controlled motives (other than one correlation between introjection and the parent's expectation that the child would continue playing). Perhaps when we forecast how long a person will continue with a musical instrument, we assume that the commitment is driven primarily by the person's authentic interests and values, and we tend to ignore the person's internal or external pressures.

Fifth, we examined indices of persisting in freely chosen optional music activities. Presumably, parents and teachers do not consider these activities to be a strict requirement like lessons and home practice, and thus these activities should be less subject to external expectations and pressures. Instead, these activities should be the product of the child's autonomous motives, or in some cases, introjected pressures that the child has developed, and they should relate negatively to amotivation. As predicted, in most cases, the indices of optional activities related negatively to amotivation, and positively to autonomous motives and introjection. However, one index—how much the child participates in music camp, master classes/workshops, and collective music-making—was unrelated to either intrinsic motivation or introjection. It may be that participation in these activities was partly a choice made by the parent, and thus related less to the child's own motivation.

Limitations and future directions

In future research, it will be important to examine the psychometric properties of the MLM in students of instruments other than the piano or violin, and in cultures other than North America. In addition, the data in this paper were correlational, and further research will be needed to confirm causal relationships between the motivation subscales and the validation concepts used here. That being said, we believe the MLM has a good theoretical foundation and sound psychometric properties, and is ready for use in a variety of research and music pedagogy settings.

The MLM can be used in music pedagogy setting to assess a student's types of motivation. The MLM also opens doors to a variety of research questions about the antecedents and outcomes of motivation in the music domain. It could help evaluate the impact of certain teaching approaches or educational interventions. It can help us understand how music teacher behaviors or parental styles can impact music student motivation. The MLM is also brief enough to be administered repeatedly in longitudinal research, to better understand circumstances in which music students' motivation may drop or rise. The subscales would be of great help when researchers and practitioners are interested in assessing the motivational changes due, for example, to maturation or changes in a student's environment. And the MLM can be instrumental in deepening our general understanding of how a person's motivations shape key outcomes in music, including diligence, depth of learning, performance, and creativity.

Acknowledgements This study was carried out at the Piano Pedagogy Research Laboratory at the University of Ottawa. We thank the many students of the laboratory for their contribution to the data collection, especially Nisreen Jardaneh, Yifei Liu, Karen Gerelus (formerly King), Andrea Yau, and Samar Abi Nasr.

Appendix

Comparison of previous version (containing 18 items) with the current version (containing 25 items)

Previous version	Current version
Amotivation	
But I don't care if I play piano or not	But I don't care if I play piano/violin or not
But I don't see the point in learning to play the piano	But I don't see the point in learning to play the piano/violin
But it is a waste of my time	But it is a waste of my time
But learning to play the piano is not worth all the trouble	~~But learning to play the piano is not worth all the trouble~~
But I don't feel excited about it	~~But I don't feel excited about it~~
But I don't know why I am doing it	~~But I don't know why I am doing it~~
	But I don't want to do it
	But I am not interested in it
External regulation	
Because my teacher would be disappointed if I stopped playing	Because my teacher would be disappointed if I stopped playing
Because my parents would be upset if I quit playing the piano	Because my parents would be upset if I quit playing the piano/violin
Because my parents would be disappointed if I stopped playing	Because my parents would be disappointed if I stopped playing
	Because my teacher would be upset with me if I stopped
	Because I will get in trouble if I don't
Introjection	
Because I would be ashamed if I stopped playing	~~Because I would be ashamed if I stopped playing~~
Because I would feel bad if I didn't learn to play the piano	~~Because I would feel bad if I didn't learn to play the piano~~
	Because I would be ashamed of myself if I stopped playing
	Because I would feel bad about myself if I didn't learn to play the piano/violin
	Because I would feel embarrassed if I stopped
	Because I would feel anxious if I didn't
	Because I would feel guilty if I don't
Identification and integration	
Because I want to be a musician when I grow up	Because I want to be a musician when I grow up
Because I see myself as a musician	Because I see myself as a musician
	Because this is what a musician does
	Because I made the decision to become a good piano/violin player
	Because this is part of who I am
Intrinsic motivation	
Because I like the sound the piano makes	~~Because I like the sound the piano makes~~
Because I enjoy learning new pieces	Because I enjoy learning new pieces
Because playing the piano is a lot of fun	Because playing the piano/violin is a lot of fun
Because it makes me feel good	Because it makes me feel good
Because I enjoy learning new things about music	Because I enjoy learning new things about music
	Because it is really interesting

References

Baker-Jordan, M. (2004). *Practical piano pedagogy: The definitive text for piano teachers and pedagogy students*. Miami, FL: Warner Bros.

Blais, M. R., Sabourin, S., Boucher, C., & Vallerand, R. J. (1990). Toward a motivational model of couple happiness. *Journal of Personality and Social Psychology, 59,* 1021–1031.

Brown, L. L. (2012). The benefits of music education. Retrieved from http://www.pbs.org/parents/education/music-arts/the-benefits-of-music-education/.

Cokley, K. O. (2000). A psychometric investigation of the academic motivation scale using a United States sample. *Measurement and Evaluation in Counseling and Development, 34,* 109–120.

Comeau, G. (2015). Les nouvelles technologies: Des outils prometteurs pour la recherche en pédagogie musicale. Orphée Apprenti. *Les Cahiers du GRiAM, 5,* 16–24.

Comeau, G. (2017). Colorful illustrations in piano method books: A pilot project investigating eye focus. *Canadian Music Educator, 57*(3), 18–33.

Comeau, G., & Huta, V. (2015). Addressing common parental concerns about factors that could influence piano students' autonomous motivation, diligence and performance. *Intersections, 35*(1), 27–52.

Comeau, G., Huta, V., & Liu, Y. F. (2015). Work ethic, motivation and parental influences in Chinese and North American children learning to play the piano. *International Journal of Music Education, 33*(2), 181–194.

Connell, J. P., & Wellborn, J. G. (1990). Competence, autonomy and relatedness: A motivational analysis of self-system processes. In M. R. Gunnar & L. A. Sroufe (Eds.), *The Minnesota symposium on child psychology* (Vol. 22, pp. 43–77). Hillsdale, NJ: Erlbaum.

Cutietta, R. A. (2003). *Raising musical kids: A guide for parents*. Oxford: Oxford University Press.

Dai, D. Y., & Schader, R. (2001). Parents' reasons and motivations for supporting their child's music training. *Roeper Review, 24*(1), 23–26.

Davidson, J. W., Howe, M. J. A., & Sloboda, J. A. (1995). The role of parents and teachers in the success and failure of instrumental

learners. *Bulletin of the Council for Research in Music Education, 127,* 40–44.
Deci, E. L., Koestner, R., & Ryan, R. M. (1999). A meta-analytic review of experiments examining the effects of extrinsic rewards on intrinsic motivation. *Psychological Bulletin, 125,* 627–668.
Deci, E. L., & Ryan, R. M. (1985). *Intrinsic motivation and self-determination in human behavior*. New York, NY: Plenum.
Deci, E. L., & Ryan, R. M. (2000). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55,* 68–78.
Deci, E. L., Ryan, R. M., Gagné, M., & Leone, D. R. (2001). Need satisfaction, motivation, and well-being in a former eastern block country: A cross-cultural study of self-determination. *Personality and Social Psychology Bulletin, 27,* 930–943.
Deci, E. L., Vallerand, R. J., Pelletier, L. G., & Ryan, R. M. (1991). Motivation and education: The self-determination perspective. *Educational Psychologist, 26,* 325–346.
Desrochers, A., Comeau, G., Jardaneh, N., & Green-Demers, I. (2006). L'élaboration d'une échelle pour mesurer la motivation chez les jeunes élèves en piano. *Recherche en éducation musicale, 24,* 13–33.
Donnat, O. (1996). *Les amateurs: enquête sur les activités artistiques des français*. Paris: Ministère de la culture, Département des études et de la prospective.
Evans, P., McPherson, G. E., & Davidson, J. W. (2013). The role of psychological needs in ceasing music and music learning activities. *Psychology of Music, 41*(5), 600–619.
Gagné, M., Chemolli, E., Forest, J., & Koestner, R. (2008). A temporal analysis of the relation between organizational commitment and work motivation. *Psychologica Belgica, 48,* 219–241.
Grolnick, W. S., Deci, E. L., & Ryan, R. M. (1997). Internalization within the family: The self-determination theory perspective. In J. E. Grusec & L. Kuczynski (Eds.), *Parenting and children's internalization of values: A handbook of contemporary theory* (pp. 135–161). New York, NY: Wiley.
Guay, F., Ratelle, C. F., & Chanal, J. (2008). Optimal learning in optimal contexts: The role of self-determination in education. *Canadian Psychology, 49*(3), 233–240.
Jenkins, G., Mitra, A., Gupta, N., & Shaw, J. B. (1998). Are financial rewards related to performance: A meta-analytic review of empirical research. *Journal of Applied Psychology, 83,* 777–787.
Kasser, T., & Ryan, R. M. (2001). Be careful what you wish for: Optimal functioning and the relative attainment of intrinsic and extrinsic goals. In P. Schmuck & K. Sheldon (Eds.), *Life goals and well-being*. Gottingen: Hogrefe.
Kavussanu, M., & Roberts, G. (1996). Motivation in physical activity contexts: The relationship of perceived motivational climate to intrinsic motivation and self-efficacy. *Journal of Sport and Exercise Psychology, 18,* 264–280.
Kim, B., & Gill, D. (1997). A cross-cultural extension of goal perspective to Korean youth sport. *Journal of Sport and Exercise Psychology, 19,* 142–155.
King, K. (2016). *Parting ways with piano lessons: Predictors, invoked reasons, and motivation related to piano student dropouts*. Unpublished Master's Thesis, University of Ottawa, Ottawa.
Klingenstein, B. G. (2009). *The independent piano teacher's studio handbook: Everything you need to know for a successful teaching studio*. Milwaukee, WI: Hal Leonard.
Losier, G. F., & Koestner, R. (1999). Intrinsic versus identified regulation in distinct political campaigns: The consequences of following politics for pleasure versus personal meaningfulness. *Personality and Social Psychology Bulletin, 25,* 287–298.
McPherson, G. E. (2000). Commitment and practice: Key ingredients for achievement during the early stages of learning a musical instrument. *Bulletin of the Council for Research in Music Education, 147,* 122–127.
Miserandino, M. (1996). Children who do well in school: Individual differences in perceived competence and autonomy in above-average children. *Journal of Educational Psychology, 88,* 203–214.
Mitchell, S. (1996). Relationships between perceived learning environment and intrinsic motivation in middle school physical education. *Journal of Teaching in Physical Education, 15,* 369–383.
Niemiec, C. P., & Ryan, R. M. (2009). Autonomy, competence, and relatedness in the classroom applying self-determination theory to educational practice. *Theory and Research in Education, 7,* 133–144.
Parker, E. J. (2006). *Piano pedagogy: A practical approach*. Surrey, BC: Longbow Publishing Ltd.
Pelletier, L. G., Fortier, M. S., Vallerand, R. J., Tuson, K. M., Brière, N. M., & Blais, M. R. (1995a). Toward a new measure of intrinsic motivation, extrinsic motivation, and amotivation in sports: The Sport Motivation Scale (SMS). *Journal of Sport and Exercise Psychology, 17,* 33–53.
Pelletier, L. G., Vallerand, R. J., Green-Demers, I., Brière, N. M., & Blais, M. R. (1995b). Loisir et santé mentale: Les relations en-la motivation pour la pratique des loisirs et le bien-être psychologique (Leisure and mental health: Relationship between motivation for leisure activities and psychological well-being). *Canadian Journal of Behavioral Sciences, 27,* 140–156.
Pitts, S. E., Davidson, J. W., & McPherson, G. E. (2000). Models of success and failure in instrumental learning: Case studies of young players in the first 20 months of learning. *Bulletin of the Council for Research in Music Education, 146,* 51–69.
Renwick, J. M., & McPherson, G. E. (2009). Multiple motives: Profiles of young Australians' reasons for musical engagement. In *Proceedings of the international symposium on performance science 2009* (pp. 469–474). Auckland: University of Auckland.
Ryan, R. M., & Connell, J. P. (1989). Perceived locus of causality and internalization: Examining reasons for acting in two domains. *Journal of Personality and Social Psychology, 57,* 749–761.
Ryan, R. M., & Deci, E. L. (2000a). Intrinsic and extrinsic motivations: Classic definitions and new directions. *Contemporary Educational Psychology, 25,* 54–67.
Ryan, R. M., & Deci, E. L. (2000b). Self-determination theory and the facilitation of intrinsic motivation, social development, and well-being. *American Psychologist, 55*(1), 68–78.
Ryan, R. M., & Deci, E. L. (2009). Promoting self-determined school engagement: Motivation, learning, and well-being. In K. R. Wentzel & A. Wigfield (Eds.), *Handbook on motivation at school* (pp. 171–196). New York: Routledge.
Ryan, R. M., Huta, V., & Deci, E. L. (2008). Living well: A self-determination theory perspective on eudaimonia. *Journal of Happiness Studies, 9,* 139–170.
Ryan, R. M., & La Guardia, J. G. (2000). What is being optimized over development? A self-determination theory perspective on basic psychological needs across the life span. In S. Qualls & N. Abeles (Eds.), *Psychology and the aging revolution* (pp. 145–172). Washington, DC: APA Books.
Ryan, R. M., Plant, R. W., & O'Malley, S. (1995). Initial motivations for alcohol treatment: Relations with patient characteristics, treatment involvement and dropout. *Addictive Behaviors, 20,* 279–297.
Ryan, R. M., Rigby, S., & King, K. (1993). Two types of religious internalization and their relations to religious orientations and mental health. *Journal of Personality and Social Psychology, 65,* 586–596.
The Royal Conservatory of Music. (2014). An overview of current neuroscience research: The benefits of music education. Retrieved from https://www.rcmusic.com/sites/default/files/files/RCM_MusicEducationBenefits.pdf.
Uszler, M., Gordon, S., & Smith, S. M. (2000). *The well-tempered keyboard teacher* (2nd ed.). Belmont, CA: Schirmer Books.

Valenzuela, R., Codina, N., & Pestana, J. V. (2018). Self-determination theory applied to flow in conservatoire music practice: The roles of perceived autonomy and competence, and autonomous and controlled motivation. *Psychology of Music, 46*(1), 33–48.

Vallerand, R. J., & Bissonnette, R. (1992). Intrinsic, extrinsic, and amotivational styles as predictors of behavior: A prospective study. *Journal of Personality, 60,* 599–620.

Vallerand, R. J., Blais, M. R., Brière, N. M., & Pelletier, L. G. (1989). Construction et validation de l'échelle de motivation en éducation. *Revue canadienne des sciences du comportement, 21,* 323–349.

Weinberg, R. S., & Gould, D. (1995). *Foundations of sport and exercise psychology*. Champaign, IL: Human Kinetics.

Wiersma, U. J. (1992). The effects of extrinsic rewards in intrinsic motivation: A meta-analysis. *Journal ofoccupational and Organizational Psychology, 65,* 101–114.

Wigfield, A., Guthrie, J. T., Tonks, S., & Perencevich, K. C. (2004). Children's motivation for reading: Domain specificity and instructional influences. *The Journal of Educational Research, 97,* 299–309.

Williams, G. C., Cox, E. M., Hedberg, V., & Deci, E. L. (2000). Extrinsic life goals and health risk behaviors in adolescents. *Journal of Applied Social Psychology, 30,* 1756–1771.

Williams, G. C., Freedman, Z. R., & Deci, E. L. (1998). Supporting autonomy to motivate glucose control in patients with diabetes. *Diabetes Care, 21,* 1644–1651.

Gerelus, K., Comeau, G., Huta, V., & Swirp, M. (Submitted). Parting ways with piano lessons: Comparing motivation between continuing and dropout piano students.