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An Exploratory Investigation of Self-Regulatory and Motivational Variables in the Music Practice of Junior High Band Students

This study examined dimensions of self-regulation and motivation in the music practice of junior high school band students. A volunteer sample of 7th- and 8th-grade students (N = 175) completed a 43-item, researcher-adapted questionnaire designed to measure the constructs of intrinsic motivation, attribution of success and failure, self-regulation, metacognition, and concentration as related to practice habits and beliefs. The questionnaire designed for this study drew from previous research in music education (e.g., McPherson & McCormick, 2000; Schmidt, 2005), educational psychology (e.g., Pintrich & DeGroot, 1990), and psychology (e.g., Nowicki & Strickland, 1973). Data were also collected regarding subjects' self-reports of practice efficiency, practice time per-day/per-session, and percentages of formal/informal practice. Factor analysis revealed five factors explaining 48% of the total variance: Concentration, Intrinsic-Goal Motivation, Intrinsic-Challenge Motivation, Metacognition-Reflective Strategies, and Commitment to Improve. Significant correlations were found between factor scores and self-reports of practice efficiency (r = .28 to .43), practicing time (r = .16 to .32), and formal/informal practicing (r = -.31 to .33).

The amount of research regarding self-regulation and motivation in music practice has grown considerably in the past 10 years (e.g., Hallam, 2001; McPherson & Zimmerman, 2002; Smith, 2005). Self-regulated learning occurs when an individual is able to initiate, monitor and sustain the personal (e.g., cognitive or affective states, motivation), behavioral (e.g., self-observing and adjusting behavior), and environmental processes (e.g., observing and adjusting environmental

influences) that affect their learning (Zimmerman & Kitsantas, 2005). Studies have examined self-regulation in music practice by means of behavioral observation (Hallam, 2001; Killian & Henry, 2005), survey (McPherson & McCormick, 1999; McCormick & McPherson, 2003), interview (McPherson, 1997; McPherson, 2005), and case study (Renwick & McPherson, 2002). Using research in general education as a base for developing a model of self-regulated learning in music, McPherson and Zimmerman (2002) highlighted the following dimensions: 1) motivation 2) strategy use 3) time management 4) self-evaluation/monitoring 5) environment and 6) social factors. Although a theoretical foundation for future studies has been proposed, the measurement of self-regulatory and motivational variables in music practice is less developed.

Results from several studies suggest that self-regulation regarding music learning may develop as students gain experience and may be more frequently used by high achieving students. In a longitudinal study, McPherson (1997) found that (a) subjects tended to use a wider range of practice strategies in their third year of playing when compared to their first and (b) high achievers reported greater use of metacognitive strategies (e.g., mental rehearsal) than did low achievers. Similarly, a longitudinal study of seven beginning band students (McPherson & Renwick, 2001) revealed that off-task behavior and amount of parental guidance decreased over a three-year period, implying a developmental trend of self-regulatory behavior. In addition, Killian and Henry (2005) observed that the behaviors isolating problem areas and scanning through easier materials occurred significantly more for high achievers than for low achievers.

Self-regulatory strategies have also been shown to be predictors of musical performance achievement. McCormick and McPherson (2003), in a study with instrumentalists ages 9-18, found significant relationships between self-report measures of cognitive strategy use, self-regulation, self-efficacy, and objective measures of performance achievement. Self-efficacy was found to be the best predictor of performance achievement while self-reports of amount of practice time and formal/informal practice were found to be indirectly related to performance achievement. In another study, McPherson (2005) interviewed beginning wind instrumentalists to determine how their practice strategies developed across a three-year period. Responses were categorized as: organizational strategies, self-correction strategies, and mental strategies. The responses were then quantified and used in regression analyses as predictor variables. Self-reports of time spent practicing were also used as predictor variables. Findings indicated that between 38% and 71% of the variance in performance achievement scores was explained by the practice strategy responses and practice times combined.

Hallam (2001), in a comparison of professional and novice musicians' practicing, suggested that concentration and the ability to organize time are also important self-regulatory factors. Hallam's interview-based data indicated that professionals reported metacognitive skills such as concentration, planning, monitoring, and evaluating, whereas novices were generally less likely to report strategies related to organization and focus. This may reflect differences between professional and novice musicians' abilities to assess their own playing and/or identify difficult passages. Madsen and Geringer (1981) investigated attentiveness, selection of effective procedures, the amount of practice time and the effects of requiring college musicians to complete a 'distraction index' while practicing. Subjects using the distraction index were asked to make a mark on a sheet each time they experienced a distraction (e.g., interruption, mind wandering) while practicing. They found that subjects using the distraction index exhibited more on-task behavior and outperformed those who did not, suggesting that the ability to concentrate is important for effective practice.

Intrinsic motivation is an important element of McPherson and Zimmerman's (2002) model of self-regulated learning in music. Intrinsic motivation has been found to be related to reports of practice time and measures of performance achievement in samples of beginning, junior high, and high school band students (McPherson & McCormick, 2000; Schmidt, 2005). Intrinsic motivation may also be related to the practicing of college musicians (Smith, 2005). Smith found task/goal motivation to be positively related to six of the seven factors extracted from a researcher-designed, practice strategy inventory, while a measure of ego/goal motivation was found to be related to just one factor. However, Smith cautions that the low reliability of the factors (α = .20 to .63) must be considered when interpreting the results.

Hamann, Lucas, McAllister, and Teachout (1998) surveyed the practice habits, perceptions, and procedures of music majors from three Midwestern universities. Re-test reliability for their extensively developed measure was found to be excellent (r = .96). Factor analysis of the survey revealed six factors which explained 57% of the variance (Internal Satisfaction, Practice and Conflicts, Practice Organization, Physical and Mental Limitations, Practice Stamina, and External Influences). The findings emphasized the importance of satisfying intrinsic mental, physical, and emotional needs through practice (Hamann et al, 1998).

Attributions for success and failure are additional elements relevant to McPherson and Zimmerman's (2002) model of self-regulated learning. The theory suggests that musicians demonstrating self-regulatory skills will generally attribute negative outcomes to causes that can be corrected in the future. McPherson and McCormick (2000) examined the attributions of success and failure of 349 instrumentalists (e.g.,

brass, woodwinds, strings, piano), ages 9 to 18. Their scale consisted of five items designed to measure several different attribution orientations (i.e., internal, external, stable, unstable). Most of the sample attributed success and failure in music to internal/unstable factors such as effort and amount of work done ahead of time.

Although many studies have examined self-regulation and motivation in music practice, relatively few have focused on the intermediate-level band student. Technical, musical, and affective development is especially crucial during an instrumentalist's intermediate years. Several studies have incorporated intermediate players as part of a larger sample (McCormick & McPherson, 2003; McPherson & McCormick, 2000) or have focused exclusively on beginners (McPherson, 2005; Renwick & McPherson, 2002). The primary purpose of this study was to explore underlying dimensions of self-regulation and motivation in junior high school band students' music practicing. A secondary purpose of this study was to investigate the construct validity of scales designed to measure concentration, intrinsic motivation, self-regulation, and attributions for success and failure in music practice. In addition, relationships among self-regulation and motivation factors as well as self-report estimates of overall practice-efficiency, practice time, and formal versus informal practicing were examined.

Method

Participants

Participants were 175 seventh (n = 94) and eighth (n = 81) grade band students from five middle-class, suburban schools in the Midwestern and Northeastern United States. A majority (78.9%) was from the two northeastern schools. The sample consisted of 89 males and 86 females, and ranged in age from 11 to 14 years (M = 12.99, SD = .70). Subjects played woodwind (n = 110), brass (n = 45), and percussion (n = 20) instruments. All subjects had at least six months of formal music training on their instrument. Volunteers were recruited by their band directors and administered a Music Practice Attitude Survey, a researcher-designed measure of Self-Regulation and Motivation in Music Practice (SRM-MP), during their regular band class time. The students were informed that responses would be confidential and that participation would have no effect on evaluations by their teachers. All data were collected within a six-week period.

Measure

The SRM-MP consisted of sub-scales that were designed to measure self-regulation (10-items), intrinsic motivation (10-items), concentration (10-items), and

attribution for success and failure in music practice (8-items). The motivation and self-regulatory sub-scales employed 7-point, Likert-type items (1 = "not at all true of me," 7 = "very true of me"). Additional items on the SRM-MP called for subjects to estimate overall practice efficiency (1 = "Extremely *Not* Efficient," 7 = "Extremely Efficient") and to provide information related to practice habits (i.e., minutes per-practice session, minutes practiced per-day, percentages of time spent on formal and informal activity) (see Table 1). With the exception of those for practice habit reports, the items were randomly ordered.

Table 1

Descriptive Statistics for all SRM-MP Scale Items (N=175)

Item #	Items by hypothesized sub-scale (Likert-type scale "1-not at all true of me" to "7-very true of me")	*M*	*SD*	*Skew*	*Kurt*
	Concentration				
2.	It is easy for me to remain focused on my music when practicing alone.	5.19	1.71	-.81	-.29
7.	If I can't play a piece right away I let it go and practice easier music. (R)	4.86	1.88	-.61	-.81
6.	I often daydream when practicing alone. (R)	4.80	1.96	-.59	-.88
24.	I can only concentrate for short periods of time when practicing. (R)	4.55	1.99	-.47	-1.02
26.	I am easily distracted when practicing. (R)	4.31	2.04	-.27	-1.21
31.	I sometimes forget what I had originally planned to work on when practicing. (R)	4.30	2.02	-.21	-1.22
12.	I have difficulty concentrating when practicing for extended periods of time. (R)	3.98	1.96	-.04	-1.24
14.	Thoughts about non-musical things often run through my head while I practice. (R)	3.97	1.96	-.12	-1.23
28.	Even when the music is dull or uninteresting, I keep practicing until I get it.	3.88	1.99	.02	-1.25
36.	When I am practicing I stop once in a while to think about what I have accomplished.	3.62	1.92	.17	-1.08
	Intrinsic Motivation				
15.	Making improvement over time through practice is important to me.	5.44	1.58	-1.05	.53
5.	I enjoy practicing interesting music even if it means giving extra effort.	5.29	1.73	-.89	-.13
4.	Doing well when I practice is important to me.	5.28	1.66	-.92	.11
30.	I practice to see how much better I can actually get at music.	4.82	1.70	-.53	-.45
10.	I like practicing music that I will learn from even if it means making a lot of mistakes.	4.78	1.75	-.58	-.42
18.	I prefer practicing music that is challenging so I can learn new things.	4.51	1.90	-.32	-1.01
35.	I practice music because I enjoy accomplishing personal goals.	4.18	2.03	-.21	-1.16
37.	I enjoy practicing because it allows me to express myself.	3.83	1.99	.08	-1.14
25.	I practice because I like the sound of my instrument.	3.77	1.88	.10	-1.07
27.	I like practicing because I enjoy solving problems.	3.05	1.68	.42	-.59

Table 1 (continued)

Item #	Items by hypothesized sub-scale (Likert-type scale "1-not at all true of me" to "7-very true of me")	*M*	*SD*	*Skew*	*Kurt*
	Self-Regulation				
19.	If I can't play a piece correctly I stop to think about how it should sound.	5.10	1.81	-.87	-.20
16.	When I learn a piece, I spend most of my time practicing the most difficult sections.	4.97	1.73	-.66	-.31
11.	I usually have a plan of what I need to practice most before I begin my practice session.	4.47	2.03	-.42	-1.13
23.	I listen to my own playing while I practice to make sure I am not reinforcing bad habits.	4.44	1.77	-.48	-.62
1.	I try to be methodical when practicing difficult musical passages.	4.24	1.58	-.21	-.63
21.	I break the music I practice intor short sections and work on themseparately	4.16	1.89	-.14	-1.08
34.	I mark my music regularly as a part of practicing.	4.10	2.05	-.08	-1.19
22.	I think about pieces I'm practicing by singing them through in my mind.	4.03	2.05	-.04	-1.27
38.	When I'm practicing I often stop playing and try to think about the best way to work out a problem.	3.94	1.77	-.03	-.85
32.	I keep a written record of my practice goals.	2.66	2.16	.95	-.60
	Internal/External Practice Attribution Scale				
9.	The effectiveness of my practicing is due to my own natural musical ability. (R)	3.57	1.78	.26	-.82
33.	I can not say why my practice is good or bad, some days I am lucky and some days I am not.	3.38	1.98	.26	-1.19
13.	Whether or not I succeed in music has little to do with my practicing.	3.37	1.89	.27	-1.04
8.	I believe that I can stop myself from developing bad practice habits. (R)	2.94	1.59	.63	-.20
29.	Practicing well is a result of my own personal hard work. (R)	2.85	1.46	.77	.36
3.	Whether or not I practice effectively has to do more with luck than anything else.	2.57	1.56	.81	-.18
17.	If I practice hard enough I can learn to play anything. (R)	2.45	1.62	1.15	.77
20.	It is useless for me to practice hard because most people are better musicians than I am.	2.12	1.56	1.49	1.48
	Practice Habits				
39.	What is the length of your average practice session in minutes?	40.28	37.27	2.41	6.06
40.	What is your average amount of practicing per day in minutes?	25.37	22.40	4.53	33.49
41.	On average, what percentage of your practice time is spent playing simply for fun with no specific musical or technical goals in mind?	40.90	29.63	.46	-1.06
42.	On average, what percentage of your practice time is spent playing with a specific musical or technical goal in mind?	54.60	30.15	-.31	-1.17
43.	On an average daily basis my practicing is: ('1-Extremely Not Efficient' to '7-Extremely Efficient')	4.84	1.35	-.71	.33

Note. (R) = score reversed

Items on the SRM-MP pertaining to self-regulation and motivation were drawn primarily from previous measures designed by Pintrich and DeGroot (1990) and McPherson and McCormick (2000). Pintrich and DeGroot (1990) used the Motivated Strategies for Learning Questionnaire (MSLQ), a 56-item, 7-point, Likert-type measure, to investigate the study habits of seventh grade science and English students. Factor analysis revealed three sub-scales of self-efficacy (α = .89), intrinsic value (α = .87), and test anxiety (α = .75) as well as two self-regulatory sub-scales labeled cognitive strategy use (α = .83) and self-regulation (α = .74). In addition, all sub-scales were significantly related to at least two measures of classroom academic performance (Pintrich & Degroot, 1990). Items from the MSLQ sub-scales intrinsic value (e.g., "I prefer class work that is challenging so I can learn new things") and self-regulation (e.g., "Before I begin studying I think about the things I will need to do to learn") were re-worded to reflect music practicing on the SRM-MP (e.g., "I prefer practicing music that is challenging so I can learn new things;" "I usually have a plan of what I need to practice most before I begin my practice session"). Pintrich and Degroot (1990) report correlations ranging from r =.63 to .83 among the intrinsic value, cognitive strategy use and self-regulation sub-scales.

The SRM-MP also included items from an adaptation of the MSLQ by McPherson and McCormick (2000). They reworded 14 of the items to reflect music practice as well as attitude towards musical performance in general (e.g., "When I'm practicing I often stop playing and think about how the music should go;" "Playing my instrument is my favorite activity"). McPherson and McCormick's (2000) analyses revealed four factors underlying the 14 items, which were similar to the factors reported by Pintrich and DeGroot (1990). The factors were Cognitive Strategy Use (e.g., "If I can't play a piece I always stop to think how it should go"), Anxiety/Confidence (e.g., "I'm scared I might freeze up when the examiner asks my scales"), Intrinsic Value (e.g., "Playing my instrument is my favorite activity"), and Self-Regulation (e.g., "I often can't decide what things to practice first"). However, reliability data and details of the factor analysis (e.g., rotation of factors) were not made clear. Both the definition and stability of the factors merit re-examination given that two of four factors were defined by just two or three items. Items from McPherson and McCormick's cognitive strategy use, self-regulation, and intrinsic value sub-scales were adapted for the present study (see Table 1).

Items on the SRM-MP regarding intrinsic motivation were also adapted from intrinsic and mastery motivation scales used by Marsh, Craven, Hinckley, and Debus (2003) and Schmidt (2005) in general education and instrumental music education, respectively. In both studies, researchers found that mastery (e.g., "I feel most successful when I reach my own goals") and intrinsic (e.g., "I practice my

music because I enjoy a challenge") motivation orientations best defined a broad Task/learning factor. Schmidt (2005) found good reliability for both intrinsic and mastery sub-scales (α = .88). In addition, the Task/learning factor identified by Schmidt was significantly related to instrumental band students' reported practice times and teacher ratings of performance achievement and effort (r = .27 to .54).

Items on the SRM-MP pertaining to concentration were based on previous literature in music practice (Gruson, 1988; Hallam, 1997; Nielson, 1999, etc.) and McPherson and McCormick's (2000) adaptation of the MSLQ. The concentration sub-scale was intended to capture the subjects' abilities to maintain focus while practicing (e.g., "It is easy for me to remain focused on my music when practicing alone") and to remain on task (e.g., "I often daydream when practicing alone").

Subjects' attributions of success and failure regarding music practice were measured by eight items adapted from the Nowicki-Strickland Locus of Control Scale for Children (Nowicki & Strickland, 1973). Items were worded to reflect internal (effort, ability) and external (chance, powerful other) attributions of success and failure in practice (see Table 1).

Results

The reliability coefficients determined for the hypothesized SRM-MP sub-scales ranged from α = .58 to .87. The attribution of success and failure in music practice scale proved to be unreliable (α = .58) and was therefore not included in analyses beyond descriptive statistics reported for each item. Means, standard deviations, and inter-item correlations were analyzed for the remaining sub-scales in an effort to identify the items that contributed the most to the overall variance of each sub-scale. Items that had low correlations (r < .51) with their respective composite sub-scale scores were eliminated. These analyses brought the total number of useable items on the SRM-MP from 43 to 28 items. In addition, items pertaining to practice efficiency or practice habits were retained. The resulting total number of items for each sub-scale was: concentration (7 items), intrinsic motivation (9 items), and self-regulation (7 items). The internal consistency of the revised sub-scales ranged from adequate to good (α = .73 to .87) (see Table 2).

Table 2
Internal Consistency of all Sub-Scales (N=175)

Original Hypothesized Scales	Number of Items	α
Concentration	10	.81
Intrinsic Motivation	10	.87
Self-Regulation	10	.76
Internal/External Attribution	8	.58
Adjusted Hypothesized Scales		
Concentration	7	.83
Intrinsic Motivation	9	.87
Self-Regulation	7	.73
Factor Scales with items loading at .40 and above		
Concentration	6	.84
Intrinsic-Goal Motivation	6	.77
Intrinsic-Challenge Motivation	3	.74
Metacognition/Reflective Strategies	5	.76
Commitment to Improve	2	.75

A two-way Multivariate Analysis of Variance was done to examine differences across the remaining SRM-MP items by gender and grade level. Because the assumption of homogeneity of variance was violated the more conservative test statistic Pillai's Trace was employed (Mertler & Vannatta, 2002). Differences in subject responses on the SRM-MP by gender and grade level were non-significant, $p > .05$. Therefore, subsequent analyses were carried out for the entire sample ($N = 175$). Differences among schools were not examined due to the discrepancy between the number of subjects from each school.

Descriptive analyses for all SRM-MP items are presented in Table 1. Standard deviations for all concentration, intrinsic motivation, and self-regulation items remaining in the analysis ranged from 1.58 to 2.05 demonstrating a good deal of variability within the items. Kurtosis values for 11 of the 28 motivation and self-regulatory items suggested slightly non-normal distributions with tendencies toward bi-modality. Item 15, "Making improvement over time through practicing is important to me," was found to be skewed (-1.05). The highest mean scores ($M = 5.28$ to 5.44) were found for items 4, 5, and 15, suggesting that many subjects consider practicing music to be an important, worthwhile activity and are motivated by making improvement. At the same time, the lowest mean score was found for item 27, "I like practicing because I enjoy solving problems" ($M = 3.05$) suggesting that this sample may be motivated by something other than practicing simply for the sake of problem solv-

ing. Although not reliable as a sub-scale, it is interesting to note that five of the eight items for attribution of success and failure in practice (#'s 3, 8, 17, 20, 29) had means (M = 2.12 to 2.94) well below the values found for the other items suggesting an overall tendency for the group to report internal attributions of success and failure (e.g., effort, ability) rather than external attributions (e.g., luck, powerful others).

The subjects' overall ratings of practice efficiency were spread across the full range of available responses (M = 4.84, SD = 1.35). This result, in addition to the skewness and kurtosis values for self-ratings of practice efficiency demonstrate that the distribution of responses for this item was somewhat normal with only a very slight tendency towards high self-ratings. The subjects' reports of practice time per-session in minutes were extremely varied (M = 40.28, SD = 37.27) with a positive skewness of 2.14 and kurtosis of 6.06. The subjects' self-reports of practice time per-day in minutes were also extremely varied (M = 25.37, SD = 22.40) with a positive skewness of 4.52 and kurtosis of 33.49. These results in combination with the examination of distribution graphs for each item suggested the presence of outliers. Several students in the sample reported practicing for relatively extreme amounts (e.g., 150 to 200 minutes per-day) while the majority of the sample reported more modest amounts of practice (e.g., approximately 30 minutes per-session, per-day). The subjects' reports of average percentages of time spent on informal and formal practicing were also quite varied, although these were more normally distributed than self-reports of minutes spent practicing. Mean values for informal and formal practice percentages were 40.90 (SD = 29.63) and 54.60 (SD = 30.15), respectively.

The SRM-MP items for the entire sample were subjected to factor analyses in an effort to determine the validity of the hypothesized sub-scales and explore underlying dimensions that may exist. The results for both principal components and maximum-likelihood factor analyses were examined in order to judge which solution provided the greatest parsimony and conceptual clarity. In addition, orthogonal and oblique factor rotation procedures for each model were examined. The Kaiser-Meyer-Olkin Measure of Sampling Adequacy for each solution was found to be acceptable at .89. Bartlett's Test of Sphericity was significant in each solution as well ($p < .001$). The analyses are also supported by a subject-to-variable ratio of 7.6:1 (see Asmus, 1989). The minimum factor loading for each item was set at .40 (Kachigan, 1991).

Both principle component and maximum-likelihood factor extraction methods resulted in five factors which met the criterion of eigenvalue ≥ 1; they explained 58% of the variance across the SRM-MP items. The examination of scree plots also suggested five factors. Given the number of items loading on each factor, the

orthogonal rotation procedure appeared to provide a more interpretable solution due to the smaller number of factor-complex items. Ultimately, the maximum-likelihood extraction with orthogonal rotation proved to be the most conceptually clear and parsimonious explanation of the data. However, only 48% of the total variance was explained (see Table 3).

Table 3

Maximum-Likelihood Factor Analysis of Scale Items with Varimax Rotation (N=175)

Item	Factors					h^2
	1	*2*	*3*	*4*	*5*	
24. I can only concentrate for short periods of time when practicing.	**.78**	.11	.01	.16	-.06	.65
12. I have difficulty concentrating when practicing for extended periods of time.	**.74**	.01	.18	.08	-.10	.59
26. I am easily distracted when practicing.	**.69**	.38	.14	.07	.09	.64
14. Thoughts about non-musical things often run through my head while I practice.	**.65**	.14	-.11	.27	.16	.55
6. I often daydream when practicing alone.	**.60**	.11	.09	-.10	.24	.45
2. It is easy for me to remain focused on my music when practicing alone.	**.49**	.11	.37	.05	.18	.42
35. I practice music because I enjoy accomplishing personal goals.	.01	**.71**	.38	.18	.14	.70
37. I enjoy practicing because it allows me to express myself.	.16	**.57**	.30	.23	-.01	.49
34. I mark my music regularly as a part of practicing.	.09	**.51**	.06	.14	.07	.29
21. I break the music I practice into short sections and work on them separately.	.17	**.47**	.02	.11	.08	.26
28. Even when the music is dull or uninteresting, I keep practicing until I get it.	.22	**.47**	.14	.19	.22	.36
27. I like practicing because I enjoy solving problems.	.04	**.41**	.29	.18	.08	.29
18. I prefer practicing music that is challenging so I can learn new things.	.19	.17	**.64**	.25	.06	.53
10. I like practicing music that I will learn from even if it means making a lot of mistakes.	.10	.33	**.55**	.17	.29	.53
5. I enjoy practicing interesting music even if it means giving extra effort.	.14	.20	**.52**	.29	.18	.45
23. I listen to my own playing while I practice to make sure I am not reinforcing bad habits.	.21	.34	.08	**.55**	.15	.48
22. I think about pieces I'm practicing by singing them through in my mind.	.00	.13	.14	**.51**	-.02	.29
19. If I can't play a piece correctly I stop to think about how it should sound.	.03	.12	.17	**.50**	.16	.31

Table 3 (continued)

Item	Factors					h^2
	1	2	3	4	5	
30. I practice to see how much better I can actually get at music.	.16	.35	.30	**.44**	.29	.51
38. When I'm practicing I often stop playing and try to think about the best way to work out a problem.	.13	.29	.35	**.40**	.07	.39
4. Doing well when I practice is important to me.	.10	.23	.29	.29	**.69**	.71
15. Making improvement over time through practice is important to me.	.24	.31	.32	.39	**.44**	.59

The highest loading item on factor one was item 24, "I can only concentrate for short periods of time when practicing alone." Each of the items loading on factor one were originally hypothesized to measure degree of concentration during practice; therefore, factor one was labeled Concentration. Factor two consisted of items that were originally part of the hypothesized intrinsic motivation and self-regulation sub-scales. Item 35, "I practice music because I enjoy accomplishing personal goals," had the highest loading on factor 2. This along with the consideration of the other items loading on the factor such as "I break the music I practice into short sections and work on them separately" suggests that factor two represents strategy use motivated to achieve personal goals. Factor two was labeled Intrinsic-Goal Motivation. Items loading on factor three were similar to those which defined factor two in that they seem to be related primarily to intrinsic motivation. The highest loading on factor three was for item 18, "I prefer practicing music that is challenging so I can learn new things." Key themes that arose in the items that loaded on factor three include the enjoyment of a challenge/putting forth effort and persistence resulting in the title Intrinsic-Challenge Motivation. With the exception of item 30, factor four consisted entirely of items that were originally from the hypothesized self-regulation scale. In addition, the majority of the items loading on this factor suggest an awareness of one's own progress and thought processes (e.g., "I listen to my own playing while I practice to make sure I am not reinforcing bad habits;" "When I'm practicing I often stop playing and try to think about the best way to work out a problem"). The highest loading on factor four was for item 23, "I listen to my own playing while I practice to make sure I am not reinforcing bad habits." Therefore, factor four was labeled Metacognition-Reflective Strategies. Although only two items loaded above the .40 criteria on factor five, the nature of each item suggested a clear overall theme of a sense of commitment to improving through practice (e.g., "Doing well when I practice is important to me;" "Making improvement over time through practice is important to me"). Factor five was con-

sequently named Commitment to Improve. The stability of the items loading onto each factor was assessed with Cronbach's α. The resulting alpha coefficients were somewhat promising, ranging from α = .74 to .84 (see Table 2).

Correlational analyses were carried out among factor scores, overall practice efficiency ratings, self-report of practice time, and self-report of informal and formal practice percentages (see Table 4). Nine outliers on the practice time self-report variables (i.e., those reporting relatively extreme amounts of practice, 150 to 200 minutes per-day) were removed from the analysis, resulting in a total of 166 cases. Significant relationships ($p < .01$) were found between the following pairs of variables (a) practice time reported per-session and practice time reported per-day; (b) informal and formal practice percentages reported; and (c) time reported per-day and overall efficiency reports. Reports of overall practice efficiency were also found to be significantly related ($p < .01$) to reports of both informal and formal practice percentages.

Table 4

Correlations Among Practice Habit Items and Factor Scores (N=166)

	Time per Day	Informal %	Formal %	Efficiency Rating	Conc	Int-G	Int-C	Met-Ref	Com
Time per Session	.21**	-.10	.14	.11	.08	.16*	-.01	-.04	.02
Time per Day		-.04	.02	.35***	.11	.32***	.25**	.16*	.17*
Informal %			-.73***	-.25**	-.23**	.20*	.04	-.31***	-.31***
Formal %				.26***	.22**	.32***	-.02	.29***	.33***
Efficiency Rating					.31***	.33***	.43***	.28***	.30***

*$p < .05$, **$p < .01$, ***$p < .001$

Note. Conc=Concentration Factor; Int-G=Intrinsic-Goal Motivation Factor; Int-C=Intrinsic-Challenge Motivation Factor; Met-Ref=Metacognition-Reflective Strategies Factor; Com=Commitment to Improve Factor

Significant correlations were also detected between the factor scores and each practice habit item (see Table 4). The significant relationships ($p < .001$) found between overall practice efficiency ratings and all factors scores ($r = .28$ to .43) suggest that the subjects' self-perceptions of practice efficiency may be intertwined with their self-regulatory behaviors and motivational beliefs. Significant relationships were detected between subjects reported formal ($r = .22$ to .33) and informal

(r = -.23 to -.31) practice percentages and the factors Concentration, Metacognition- Reflective Strategies, and Commitment to Improve. These findings suggest that those who report more concentration, metacognitive strategy use, and commitment to improve may be more likely to practice with specific musical or technical goals in mind. Significant correlations were also found between practice time reported per-day and the factors Intrinsic-Goal (r = .32), Intrinsic-Challenge (r = .25), Metacognition-Reflective Strategies (r = .16), and Commitment to Improve (r = .17) suggesting that subjects who reported higher amounts of intrinsic motivation and self-regulatory strategy use may be more likely to practice for longer amounts of time per-day. Although thought provoking, the findings regarding the factor scores must be interpreted with caution when considering the small number of items loading on several of the factors and the tentative nature of the factor labels. In addition, the practical significance of the relationships found between the factor scores and the practice habit items may also be questionable when considering the small amounts of variance explained (e.g., 3% to 11%).

Discussion

The results suggest that the volunteer subjects in this study perceived music practice as an important, worthwhile activity and seemed to be motivated by intrinsic elements such as meeting personal goals and challenges as well as making improvement. The sample's overall ratings of practice efficiency, reports of practice time, and reports of formal/informal practicing reported were highly varied. Although the subjects in this study were volunteers, the degree of variability in the practice habit reports suggests that this sample may be somewhat representative of a broader junior high band population. In addition, the minimal reports of time spent practicing in combination with tendencies toward informal practicing distinguishes this sample as novice when compared to contrasting findings for more experienced musicians (Ericsson, 1996). However, it is important to note that self-reports of practice time may be unreliable. For example, Geringer and Kostka (1984) found that self-reports of practice time were greater than twice those made by independent observers.

Because the attribution of success and failure scale proved to be unreliable, it was not included in the factor analyses. However, the sample's responses on most of the attribution items showed an internal tendency, suggesting that the sample attributed their successes and failures in music practice more to effort and ability rather than luck or chance. This tentative finding supports those reported by McPherson and McCormick (2000) and other research regarding the attributions of secondary music students (e.g., Asmus, 1994).

The hypothesized sub-scales of concentration, self-regulation, and intrinsic motivation proved to have a more complex underlying structure than initially hypothesized. The clearest factor solution resulted in five factors identified as: Concentration, Intrinsic-Goal Motivation, Intrinsic-Challenge Motivation, Metacognition-Reflective Strategies, and Commitment to Improve. This five factor solution demonstrates a greater degree of overlap in the constructs of intrinsic motivation and self-regulation when compared to the previous findings in music (McPherson & McCormick, 2000) and general education (Pintrich & DeGroot, 1990). The differences may be due to the addition of researcher-designed concentration items as well as other items created in an effort to provide more stability to the hypothesized constructs of intrinsic motivation and self-regulation. The differing results may also be due to geographical and/or age differences among the samples. However, the factors found in this study do bear some resemblance to those found by Hamann et al. (1998) labeled Physical/Mental Limitations, Internal Satisfaction, and Practice Organization.

Significant relationships were found among overall practice efficiency ratings, practice habit items, and factor scores. Practice times reported were found to be significantly related to practice efficiency ratings, suggesting that subjects may be equating the amount of time they spend practicing with how effectively they practice. The significant, positive relationship between formal practice percentages and efficiency ratings suggests that subjects who spend more time on purposeful, deliberate practice activities perceive their own practicing as efficient. The significant, negative correlation found between informal practice percentages and efficiency ratings suggests an inverse relationship in that those subjects who spend more of their time on informal activities perceive their practicing to be less efficient.

The significant relationships found between the factor scores and practice habit items must be interpreted with caution due to the small number of items loading on several factors, the preliminary nature of the factor labels, and the minimal amounts of variance explained. However, the significant correlations found suggest that further research with more stable and sufficiently validated measures is called for. It is logical to suggest that those who report the highest levels of concentration, intrinsic motivation, metacognitive strategy use, and commitment to improve may also be the most efficient in their practicing. The significant relations between reported practice time per-day and the factors Intrinsic-Goal, Intrinsic-Challenge, Metacognition-Reflective Strategies, and Commitment to Improve suggest a possible link between subjects' levels of intrinsic motivation and their willingness to spend time practicing. This supports previous findings of significant relationships between intrinsic motivation and music practice (Hamann et al., 1998;

Schmidt, 2005). In addition, the significant relations found between formal and informal practice percentages and the factors Concentration, Metacognition-Reflective Strategies, and Commitment to Improve suggest that the subjects associate elements of concentration, commitment, and self-regulatory behavior, with practicing with specific musical or technical goals in mind.

Overall, the findings of this study support previous work that has highlighted the relevance of intrinsic motivation, concentration, organization, and cognitive strategy use to music practice. This study has shown that motivational and self-regulatory constructs in music practice are complex and worthy of continued study. This study also demonstrates the importance of considering differences that may arise when adapting measures and theoretical models for use across various populations and domains. Research regarding motivation and self-regulation in music practice would benefit from future studies designed to increase the reliability and validity of measures. Behavioral analyses conducted for confirmation of self-report data would also be beneficial. More research focused specifically on the intermediate band student may be particularly helpful when considering the relative lack of studies that investigate that population. Detailed information about motivational and self-regulatory factors in music practice can serve to help teachers guide their students towards becoming more efficient and effective music learners.

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References

Asmus, E. P. (1989). Factor analysis: A look at the technique through the data of Rainbow. *Bulletin of the Council for Research in Music Education, 101*, 1-29.

Asmus, E. P. (1994). Motivation in music teaching and learning. *Quarterly Journal of Music Teaching and Learning, 5*(4), 5-32.

Barry, N., & Hallam S. (2002). Practice. In R. Parncutt & G. E. McPherson (Eds.), *The science and psychology of music performance: Creative strategies for teaching and learning* (pp. 151-165). NY: Oxford University Press.

Ericsson, K. A. (1996). The acquisition of expert performance: An introduction to some of the issues. In K. A. Ericsson (Ed.), *The road to excellence* (pp. 1-50). Mahwah, NJ: Erlbaum.

Geringer, J. M., & Kostka, M. J. (1984). An analysis of practice room behavior of college music students. *Contributions to Music Education, 11*, 24-27.

Gruson, L. (1988). Rehearsal skill and musical competence: Does practice make perfect? In J. A. Sloboda (Ed.), *Generative processes in music: The psychology of performance, improvisation, and composition* (pp. 91-112). Oxford: Clarendon Press.

Hallam, S. (1997). Approaches to the instrumental music practice of experts and novices: Implications for education. In H. Jorgensen & A.C. Lehman (Eds.), *Does practice make perfect? Current theory and research on instrumental music practice* (pp. 89-108). Oslo: Norges Musikkhogskole.

Hallam, S. (2001). The development of metacognition in musicians: Implications for education. *British Journal of Music Education, 18*(1), 27-39.

Hamann, D. L., Lucas, K. A., McAllister, P., & Teachout, D. (1998). An investigation into the factors contributing to individual practice. *Journal of Band Research, 34*(1), 59-68.

Kachigan, S. (1991). *Multivariate statistical analysis: A conceptual introduction* (2nd ed.). NY: Radius Press.

Killian, J., & Henry, M. (2005, February). A comparison of successful and unsuccessful strategies in individual sight-singing preparation and performance. Paper presented at the Desert Skies Research Symposium, Tucson, AZ.

Madsen, C. K., & Geringer, J. M. (1981). The effect of a distraction index on improving practice attentiveness and musical performance. *Bulletin of the Council for Research in Music Education, 66*, 46-52.

Marsh, H., Craven, R., Hinckley, J., & Debus, R. (2003). Evaluation of the big-two factor theory of academic motivation orientations: An evaluation of jingle-jangle fallacies. *Multivariate Behavioral Research, 38*, 189-224.

Mertler, C. A., & Vannatta, R. A. (2002). *Advanced and multivariate statistical methods* (2nd ed.). Los Angeles, CA: Pyrczak Publishing.

McCormick, J., & McPherson, G. E. (2003). The role of self-efficacy in a musical performance examination: An exploratory structural equation analysis. *Psychology of Music, 31*(1), 37-51.

McPherson, G. E. (1997). Cognitive strategies in skill acquisition in musical performance. *Bulletin of the Council for Research in Music Education, 133*, 64-71.

McPherson, G. E. (2005). From child to musician: Skill development during the beginning stages of learning an instrument. *Psychology of Music, 33*(1), 5-35.

McPherson, G. E., & McCormick, J. (1999). Motivational and self-regulated learning components of musical practice. *Bulletin of the Council for Research in Music Education, 141*, 98-102.

McPherson, G. E., & McCormick, J. (2000). The contribution of motivational factors to instrumental performance in a music examination. *Research Studies in Music Education, 15*, 31-39.

McPherson, G. E., & Renwick, J. M. (2001). A longitudinal study of self-regulation in children's musical practice. *Music Education Research, 3*(2), 169-186.

McPherson, G. E., & Zimmerman, B. J. (2002). Self-regulation of musical learning: A social cognitive perspective. In R. Colwell & C. Richardson (Eds.), *The New handbook of research on music teaching and learning* (pp. 327 – 347). NY: Oxford University Press.

Nielsen, S. G. (1999). Learning strategies in instrumental music practice. *British Journal of Music Education, 16*(3), 275-291.

Nowicki, S., & Strickland, B. (1973). A locus of control scale for children. *Journal of Consulting and Clinical Psychology, 40*, 148-154.

Pintrich, P. R., & DeGroot, E. V. (1990). Motivational and self-regulated learning components of classroom academic performance. *Journal of Educational Psychology, 82*(1), 33-40.

Schmidt, C. P. (2005). Relations among motivation, performance achievement, and music experience variables in secondary instrumental music. *Journal of Research in Music Education, 53*(2), 134-147.

Smith, B. (2005). Goal orientation, implicit theory of ability, and collegiate instrumental music practice. *Psychology of Music, 33*(1), 36-57.

Zimmerman, B. J., & Kitsantas, A. (2005). The hidden dimension of personal competence: Self-regulated learning and practice. In A. J. Elliot & C. S. Dweck (Eds.), *Handbook of competence and motivation* (pp. 509-526). NY: Guilford Press.