

2002

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Recommended Citation

Brozak, George A. (2002) "The Perception of Musical Tension in Percy Grainger's Irish Tune from County Derry Among Music Majors and Non-Music Majors," *Visions of Research in Music Education: Vol. 2* , Article 7.

Available at: <https://opencommons.uconn.edu/vrme/vol2/iss1/7>

The Perception of Musical Tension in Percy Grainger's *Irish Tune from County Derry* Among Music Majors and Non-Music Majors

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The purpose of this study was to determine whether non-major instrumental student musicians at the university level perceive tension in music differently than student musicians majoring in music. Students (N=40) comprised four groups. Group A and Group B consisted of undergraduate students (N=20) who were non-music majors and members of an auditioned university concert band. Group C and D consisted of undergraduate students (N=20) who were music majors. While listening to the selected composition, students registered their individual perception of tension by means of the Digital Affective Response Technology (DART) software. During playback of the selected stimuli, subjects utilize a Likert scale of discrete data points within DART to quantify perceived affective responsiveness from 1 (lowest level) to 10 (highest level). Individual means were then collected from each group (A, B, C, D) and graphed cross-categorically according to level of performance history (majors/non-majors who have performed (A & C) and majors/non-majors who have not performed (B & D)). An unpaired t-test of combined Groups A and C ($t [20] = -1.073, p = .2975$) and an unpaired t-test of combined Groups B and D ($t [20] = 1.639, p = .1186$) indicated no significant difference of perceived tension between the subjects of these groups.

Brozak, G. A. (2002). The perception of musical tension in Percy Grainger's *Irish Tune from County Derry* among music majors and non-music majors. *Visions of Research in Music Education*, 2. Retrieved from <http://www-usr.rider.edu/~vrme/>

The insightful selection of musical repertoire is a crucial and fundamental task of the conscientious music educator. As the primary pedagogical material used in instrumental ensembles, repertoire is the foundation upon which the majority of musical growth is built.

What constitutes high-quality band literature? What characteristics elevate a composition to the category of high quality literature? Reimer (1989) offers:

That literature is what we teach, including the expressive experience each piece offers, general musical learnings each piece fosters, skills of performance each piece helps develop, and understandings about performance itself as an essential artistic role that arises from creating each piece. (p. 192)

As the subject of musical tension is narrow in scope within the field of musical research, a thorough review of the literature must also include other stimuli as they affect tension, including aesthetic response (Madsen, Brittin & Capperella-Sheldon, 1993), tempo modulation, as it applies to continuous data collection (Sheldon, 1994; Sheldon & Gregory, 1997), listening preferences (Gregory, 1994), musical maturity, rubato (Johnson, 1996) and other topics germane to the context of this review.

The perception of musical tension is certainly not a new phenomenon. Composers have long known and diligently used in their works the idea of tension and release, *Sturm und Drang*, "ebb and flow."

One of the cornerstone pieces of the wind band literature, Holst's *First Suite in E-flat*, is widely considered to be a staple in band repertoire and a superior example of high quality music. Williamson (1998) asked eleven prominent wind band conductors (Battisti, Corporon, Croft, Hunsberger, Junkin, Kirchhoff, McMurray, Reynolds, Smith, Whitwell and Williamson) to list 30 of the "best" works for band -- the basic repertoire that every band conductor simply *must* learn during a serious professional career (p. 92-104). All listed the Holst *Suite in E-flat* in their "best" selections. Sharing this honor were three other works including Percy

Grainger's Lincolnshire Posy, Paul Hindemith's *Symphony in B-flat*, and Karel Husa's *Music for Prague, 1968*.

Written in 1909 by English composer Gustav Holst (1874-1934), "... the opening theme of the first movement ("Chaconne") is repeated incessantly by various instruments as others weave varied filigrees about the ground theme" (Smith & Stoutamire, 1972-1982, p. 114).

Two landmark studies, which provide fascinating research into the area of tension, utilize this movement as "Rosetta stone" material (Capperella-Sheldon, 1992; Fredrickson, 1999).

Capperella-Sheldon investigated the differences and similarities of self-perception in aesthetic experience to wind band music. As they listened to the selected works, subjects recorded their response in "real-time" via the Continuous Response Digital Interface (CRDI). Through the aid of custom software, the CRDI device transferred subject input at predetermined intervals directly to a personal computer. Findings indicate little differentiation in the aesthetic perception among musicians and non-musicians. Additionally, all subjects reported having at least one aesthetic experience and agreed that the CRDI approximated those experiences across the continuum. Fredrickson (1999) first examined how musicians who "know" a piece (rehearsed and performed) perceive musical tension differently than do listeners who have never performed the work. Additional studies by Fredrickson (1997) among elementary, middle, and high school students and Madsen (1998) among university music majors utilized the CRDI device to measure perceived tension, although with different repertoire selection (*Haydn's Symphony No. 104*).

The selection of repertoire from which to measure perceived tension for this study was deemed equally important. *Irish Tune from County Derry* was chosen based on its inherently expressive and lyrical qualities. Additionally, it is listed by 10 of 11 expert conductors as high-

quality wind band literature (Williamson, 1998, p. 92-104). The high degree of liking of *Irish Tune from County Derry* is relevant to this study. Though the popularity of this composition ensured that most subjects would have intimate knowledge of its performance, this also served to confound the selection process of subjects in Group D (music majors who had not performed the work). At what level does the degree of liking affect the outcome of perceived tension (Hargreaves, 1994; Hargreaves & Castell, 1987; Gregory, 1994)?

An integral component of each study is the use of CRDI to measure aesthetic response. This device provides a pointer dial approximating the level of aesthetic responsiveness across a continuum (0, lowest degree to 241, highest degree). Data is collected at predetermined intervals and transmitted digitally to the appropriate operational/analytical software. Research conducted on the reliability of data across the CRDI has been extremely high (Capperella, 1989; Gregory, 1989, 1995; Tyler, 1996; Zeigler, 1996). The Digital Affective Response Technology (DART) software was developed as a software-based alternative to the CRDI (Dobbe, 2001). It should be noted that reliability across the DART is in its infancy and has yet to achieve the empirically established status of the CRDI.

Purpose

The purpose of this study was to determine whether non-major instrumental student musicians at the university level perceive tension in music differently than student musicians majoring in music. The hypothesis is that there may be differences in the level of tension perception (dependent variable) between music majors and non-music majors (independent variable) based on their "knowing" of a work through its performance.

Method

The study included students (N=40) from a large Midwest university who were divided into four distinct groups, randomly selected after completing a short questionnaire regarding their status as music major (major/non-major) and their performance history (have performed/have not performed) of *Irish Tune From County Derry* by Percy Grainger. This composition was selected following a literature review of high quality band literature from Dvorak (1993): Best Music for High School Band, Miles (1996): Teaching Music Through Performance in Band, Williamson (1998): Rehearsing the Band, and National Band Association (2000): Selective List for Bands. The selected composition was considered rhythmically and harmonically simplistic, allowing participants to focus more easily on task at-hand: the perception of tension. Difficulty level (IV) and expressive qualities of the work were also determining factors in selection.

Participants were placed in 4 groups. Group A consisted of undergraduate students who were non-music majors and members of an auditioned university concert band that had performed the selected composition. Group B consisted of undergraduate students who were non-music majors and members of an auditioned university concert band that had not performed the selected composition. Group C consisted of undergraduate students who were music majors currently enrolled in Music 244 (TEACHING OF INSTRUMENTAL MUSIC) who had performed the selected composition. Group D consisted of undergraduate students who were music majors and selected randomly from the School of Music population via verbal interrogative that had not performed the selected composition. It was hypothesized that there may be differences in the level of tension perception between students who "know" a piece from having performed it and students who do not "know" a piece through performance. All

students regardless of their performance history listened to a sound recording of *Irish Tune from County Derry* performed by the University of Illinois Symphonic Band (1992), and conducted by Dr. Harry Begian. Track 11 of the recording (*Irish Tune from County Derry*) was extracted from the original recording using an Apple PowerBook G3 computer, Que! Firewire CD-RW drive, and Adaptec Toast 4.2 software. The extracted excerpt was transferred to ten individual compact disc media (one per subject), allowing pure digital playback. Duration was approximately 3 minutes and 26 seconds.

Subjects were scheduled to listen to the selected recording in groups of ten, with some individuals listening in smaller groups or individually due to scheduling conflicts. Testing took place in a Computer Assisted Music Instruction Lab utilizing Apple Macintosh G3 and G4 computers equipped with external (outer ear) headphones. Each computer had its own set of headphones, and the lab environment was quiet with an adequate level of lighting. While listening to the selected composition, students registered their individual perception of tension by means of the Digital Affective Response Technology (DART) software, version 2.1, developed by Dr. Kevin Dobbe of Rochester, Minnesota. The software begins playback of the selected track from the internal compact disc, and utilizes a Likert scale of discrete points to quantify perceived affective responsiveness from 1 (lowest level) to 10 (highest level). Following completion of the stimuli playback, 196 distinct data points (the selected work is 3 minutes and 26 seconds in length, or 196 seconds) were then transferred to an individual student file on the Macintosh computer hard drive.

Before the experiment began, all subjects were given the following verbal instructions:

Thank you for taking part in this experiment. The musical selection you are about to hear is *Irish Tune from County Derry* by Percy Grainger. This study is an endeavor to provide further research into the perception of tension in music. You will be using the computer in front of you to "record" your responses to the musical selection. As you carefully listen to *Irish Tune*,

use the up arrow (a) or down arrow (e) on the computer keyboard to indicate your perception of musical tension in relation to the level of the music that is playing. You may move your level as many times as you wish throughout the playing of *Irish Tune*. There are no correct or incorrect answers. Please pre-set the indicator level to "1" (lowest setting). When the music begins, move your level up (high perception) or down (low perception) as you hear the tension increase or decrease in *Irish Tune*. At the conclusion of the experiment, the music will stop, and the computer program will give a final readout on screen. At this point, you need do nothing else. The experiment is over. If you have any questions, please ask them now.

No definition was offered for the meaning of tension. When a subject asked the facilitator this question, the prepared response given was, "Use your best judgment."

Before beginning the stimulus portion of the experiment, subjects were permitted to acclimate themselves to the computer keyboard, specifically the up and down arrows. These arrows provided the method of input by which the DART program tracked subject responses. A visual representation was also provided in correlation to the subject input levels. When a positive level of confidence was reported to the facilitator, all subjects were instructed to put their headphones on and click "Next" on the DART software screen. This began stimuli playback, and the recorded portion of the experiment.

Results

This study was designed to determine whether non-major instrumental student musicians at the university level perceive tension in music differently than student musicians majoring in music. A key component in providing validity to this exercise was the method of translating an individual aesthetic perception - tension - into a quantifiable, qualifiable value. Subjects within the four groups (A, B, C, D) possess varying degrees of musicality, musical experience, and aesthetic feelingfulness. Though these incongruities can result in extreme ranges within the group, the effectiveness of randomization sufficiently ensures an authentic sample of the population. Results of the 40 individual data files were collected and imported into Microsoft

Excel 2001 software for calculation and charting. A Likert scale was utilized in recording subject responses, ranging from 1 (low perception of tension) to 10 (high perception of tension). Each data file contained 196 distinct data points (1 data point per second, *Irish Tune* = 3 minutes and 26 seconds in length, or 196 seconds) for 7,840 aggregate data points. The combined mean scores for Groups A and B (non-music majors, see Figure 1) and Groups C and D (music majors, see Figure 2) were then computed and uploaded to StatView 4.5 for statistical treatment (see Table 1).

Individual means were then collected from each group (A, B, C, D) and graphed cross-categorically according to level of performance history (majors/non-majors who have performed, see Figure 3 and majors/non-majors who have not performed, see Figure 4). An unpaired t-test of combined Groups A and C ($t [20] = -1.073, p = .2975$) indicated no significant difference between the subjects of that combined group (see Table 2). An unpaired t-test of combined Groups B and D ($t [20] = .862, p = .1186$) indicated no significant difference between the subjects of that combined group (see Table 3).

A visual examination of the data graphs reveals a high degree of similarity and agreement among all subject groups. While no two graphs are identical, inference may be made that the measured degree of intensity among majors and non-majors provides differentiation among the data points. The results of two unpaired t-tests confirm the findings of this cursory examination.

Discussion

It seems apparent that the continued use of technology to obtain measured levels of affect and perception is well founded. Data obtained on CRDI reliability (Capperella, 1989; Gregory, 1989, 1995; Tyler, 1996; Zeigler, 1996) has been determined to be extremely high. Though no

such research data currently exists for the DART software, inference may be made by the results of this study (compared to previous CRDI studies) that measurement across both instruments appears analogous. While the smooth tactile interface of the CRDI is appealing, the benefits of the DART software should not be ignored. The ability to use DART on multiple computers as testing stations (CRDI = 4), the ability to instantly and automatically synchronize compact disc recordings with measurement over time (CRDI = depressing keystroke of computer and start button of stimulus playback), and ease of data import/manipulation from individual student files (CRDI = 5.25 "floppy disks") constitute salient features relevant to the researcher. Future research directed to provide (or withhold) correlation between both instruments appears justifiable. Of particular interest would be study into the use of DART with young (elementary) school-age (Byrnes, 1997; Fredrickson, 1997) and mentally handicapped children (Byrnes, 1997).

Of particular importance to this study is the level of musical sophistication among subjects (college undergraduate students). Research into listening preferences (Gregory, 1994) provides insight into the level of "knowing" subjects possess of a musical work, and how this "knowing" becomes manifest in aesthetic experiences (Geringer & McManus, 1979). Subject perception of compositional quality of a work and quality of performance of a work (Madsen, Brittin & Capperella-Sheldon) and the degree of repetition on music "knowing" and liking appear seemingly relevant to the degree of magnitude of the aesthetic experience. The hypothesis that music majors would possess a higher level of musical perception of tension seems born out by intimate knowledge and study of these relevant issues. Resulting data obtained from this experiment do not lend credence to this hypothesis. The relationship or "connective tissue" between musical sophistication and magnitude of perception of tension

appear to have little correlation, thus negating a method prediction.

Many questions surface as a result of these findings: What level of tension is perceived in music not considered high quality? How does lexicon and verbal descriptors of aesthetic terminology (good/bad, beautiful/ugly, tense/relaxed) effect perception of tension? What correlation outcome is determined by using technology-based performance stimulus (instead of "live" performers)? To what extent does dynamic contrast confound perceived tension? Does expressive performance quality effect the perception of tension, or is this perception solely a product of compositional technique and construction? What is the effect of strict and expressive conducting techniques on the resulting perception of tension from a "live" recording? Do expert conductors with intimate knowledge of the performance work affect aesthetic responsiveness and perception of tension? To what degree does the visual representation of the DART software Likert-type graphic display affect response of the subject. What degree of reliability and correlation can be obtained between the CRDI and DART instrumentation? Certainly, the results of this and similar studies have long-range implications for the music educator. That perception among music majors and non-majors is so strongly correlated serves as a reminder that all students are influenced in much the same way, regardless of their desired field of study. Only the magnitude of this perception appears to be dependent upon musical sophistication and performance history.

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Table 1.
Mean, Median and Standard Deviation of the Two Major Groups

	Non Musicians	Musicians
N	20	20
Mean	4.24	4.12
Median	4.43	4.16
SD	1.42	1.07

Table 2.
Variable Data for Group HAVE PERFORMED (Groups A and C)

	N	Mean	Variance	SD	Std. Err
Non-Majors	10	3.762	1.928	1.388	.439
Majors	10	4.376	1.347	1.161	.367

Table 3.
Variable Data for Group HAVE NOT PERFORMED (Groups B and D)

	N	Mean	Variance	SD	Std. Err
Non-Majors	10	4.719	1.833	1.354	.428
Majors	10	3.857	.934	.966	.306