Predictable Factors in Sedative Music (PFSM): A tool to identify sedative music for receptive music therapy

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Abstract

This article introduces a tool developed to help clinicians and researchers choose appropriate sedative music for receptive music therapy when individuals attending treatment or participating in research cannot select their preferred stimulus. It outlines the three steps involved in developing the tool - finding out what has been already devised to categorise sedative music, choosing a suitable starting point for a new system, and using that starting point to draw up the new tool (Predictable Factors in Sedative Music (PFSM)). The PFSM quantifies sedative music by categorising six different musical factors as either predictable or unpredictable (one factor (melody) has five subsections). Finally, this article presents a study carried out to validate the PFSM. Twenty-five music therapists submitted sedative and stimulative music selections for blind PFSM evaluations. Although some discrepancies in scoring stimulative selections suggested that a separate tool was needed to identify stimulating music, the PFSM performed reliably scoring the participants’ sedative selections and the study confirmed the intrinsic validity of the PFSM. The discussion suggests that the PFSM can ensure more effective music therapy practice not only by helping music therapists identify a sedative stimulus for receptive music therapy but also by helping music therapists who use improvisation to develop an understanding of how to manipulate separate musical factors.

Key words: Receptive music, sedative music, stimulus selection

Receptive music therapy always involves listening, and the first requirement of any receptive music therapy intervention is to select music suited to the individual, their situation and the purpose for which it is to be used (Wigram, Pedersen, & Bonde, 2002). However, the same piece of music can produce a different emotional experience for each person (between-person variation), and can move a person to tears on one occasion while s/he remains completely detached on another (within-person variation) (Sloboda, 2005).
Clearly, each person should be involved in the choice of music for receptive music therapy. When Hadsell (1989) asked 91 participants to rate the sedative quality of thirty-four pieces of music, significant differences in their overall ratings led her to conclude “that no group method of selection will substitute for individual verification” (p. 114). However, this type of verification may not always be possible. First, personal preference has to be ignored during group interventions. Second, an individual may not be able to express their preferred choice either because of cognitive impairment, because a physical condition prevents them from communicating with others, or simply because they do not know what music they prefer. This article describes the Predictable Factors in Sedative Music (PFSM) - a tool devised to help clinicians and researchers in these circumstances. It introduces some of the systems already used to identify sedative music; traces why and how one of these systems was used to develop the PFSM and presents a study carried out to validate the tool.

**Development of the PFSM**

It was Everett Thayer Gaston who first categorised stimulative and sedative music (Hadsell, 1989). Gaston (1951) identified the qualities of both types of music and described how they affected the listener: stimulative music exhibited an unrestrained quality, and contained brief, staccato melodies, a clear underlying beat and percussive rhythms that encouraged physical activity. Sedative music encouraged a dream like mood. More legato melodic motifs, non-accented beats and unclear rhythmic pulses produced a calming effect.

Spintge (1993) and Shoemark (2004) devised ways of identifying a specific sedative stimulus. Spintge (1993) differentiated ‘anxioalgolytic’ music (a background stimulus for operating theatres) from relaxing music. ‘Anxioalgolytic’ was very high or low frequency music (20Hz to 10,000 Hz) with a ‘floating’ quality and absolutely no rhythmic contrast. In contrast, relaxing music fell between 600 Hz and 900 Hz and it had a ‘constant’ rhythmic quality. When Shoemark (2004) selected music for The Royal Children’s Hospital in Melbourne, Australia, she categorised entire sedative compact discs (CDs) as having consistent levels for all/most musical elements, and individual sedative tracks as minimum range/minimum change in all/most musical elements.

Wigram (1996) and Erdonmez Grocke (1999) began investigating ways of analyzing music in their PhD studies. Wigram (1996) developed his ideas during Vibroacoustic Therapy research, and later published them as a list of the potential elements in sedative music and a list of the potential elements in stimulating music (Wigram, Pederson & Bonde, 2002). Wigram (1996) drew on studies that examined the relationship between structural musical factors and perceived expression and discovered a sedative response.
when there were few or no changes to tempo, pitch, loudness, interval
distribution or melodic range. He defined the parameters that influence
whether a piece of music might affect stimulation or relaxation in terms of
predictability within the music. Whereas people maintained a higher level of
arousal and stimulation when the elements in the music varied significantly
over time, they tended to relax if musical elements were stable and
predictable.

Erdonmez Grocke (1999) devised the Structural Model for Music
Analysis (SMMA) while researching Guided Imagery and Music (GIM).
The SMMA drew on a list of musical elements formulated but not published
by Bonny (the founder of GIM). It had twelve categories of musical elements
(style and form, texture, time, rhythmic features, tempo, tonal features,
melody, embellishments ornamentation and articulation, harmony timbre and
quality of instrumentation, volume, intensity), and three categories concerned
with mood, symbolic and associative meaning and performance (Wigram,
2004). The SMMA standardised phenomenological descriptions of music. It
summarised the main features of a piece of music and identified soothing
elements.

Wigram’s notion that the musical factors of sedative music are stable
and predictable (Wigram, 1996), and several statements from Wigram’s
published lists (Wigram et al., 2002) was used to delineate sedative music in
Table 1. The author chose Wigram’s published lists as a starting point for a
new tool because they described individual musical factors. Gaston (1951),
Spingte (1993) and Shoemark (2004) did not have this level of detail in their
classification systems. Grocke (1999) included twelve musical elements, but
the SMMA analysed music and identified soothing elements: it was not
considered a suitable starting point for a tool that would evaluate the overall
sedative worth of a stimulus. Furthermore, the link Wigram made between
relaxation and predictability was expressed later by Calabro, Wolfe, and
Shoemark (2003) who developed identifying elements of sedative music for
use in Neonatal Intensive Care Units for premature infants, with “minimum
range and minimum change in tonality, tempo, register, timbre, volume and
attack” (p. 8).
Table 1
Predictable Factors in Sedative Music (PFSM)

<table>
<thead>
<tr>
<th>Musical factor</th>
<th>Description of predictability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>Closely follow verse/chorus, introduction/verse/chorus (popular music) or binary, ABA, AABA, sonata form, theme and variations structures (classical music).</td>
</tr>
<tr>
<td>Tempo</td>
<td>Remaining stable with gradual increases (accelerandos) or decreases (ritardandos).</td>
</tr>
<tr>
<td>Volume</td>
<td>Remaining stable with gradual increases (crescendos) or decreases (diminuendos).</td>
</tr>
<tr>
<td>Texture</td>
<td>Remaining stable with subtle changes in style or instrumentation.</td>
</tr>
<tr>
<td>Melody Line</td>
<td>Repetition of material. Little embellishment, no unexpected pauses or breaks.</td>
</tr>
<tr>
<td>Melodic Timbre</td>
<td>Gentle sound with gradual changes within and between instrument families.</td>
</tr>
<tr>
<td>Melodic Pitch</td>
<td>Gradual changes between registers.</td>
</tr>
<tr>
<td>Melodic Accents</td>
<td>Few; used to add expression rather than energy to a melodic line.</td>
</tr>
<tr>
<td>Harmony</td>
<td>Modulations; cadences that don’t introduce unexpected harmonies or dissonance.</td>
</tr>
</tbody>
</table>

(Bold text indicates statements drawn from Wigram’s published lists and ordinary text is statements made by the author of this article).

Validating the PFSM

Aim

The aim of this study was to determine if the PFSM (Table 1) could be used to objectively confirm personal selections of instrumental and vocal sedative music.

Participants

This study formed part of the author’s doctoral research and ethical approval was sought and received from the hosting university, the University of Abertay, Dundee, Scotland.

The author recruited the participants by mail from music therapists working in the United Kingdom. The author chose sixty music therapists from the Association of Professional Music Therapists (APMT) year book and invited them to participate in the investigation. They each received a letter of explanation and the materials needed to take part (two CDs, response form and envelope). Each was asked to “think about the music you enjoy listening to and identify music that makes you feel calm and relaxed (sedative), and music that makes you feel energetic and want to move or
dance (stimulative). It can be performed by a singer(s) or by instrumentalist(s), and can be in any genre (e.g. new age, jazz, rock, folk, classical)"

The participants were invited to submit two pieces of music and to burn one piece of music on to each CD provided. One third of those approached were asked to submit one sedative and one stimulative selection, one third to submit two sedative selections and one third to submit two stimulative selections. The stimulative choices were used as a control, and inviting different combinations ensured that evaluations could not be carried out by simply judging the first selection and then placing the second in the opposite category. The author had coded the stamped addressed envelopes provided for those invited to participate, and after 32 replies had been received 25 people had provided the pairs of CDs needed for 25 sedative and 25 stimulative choices – nine had submitted one sedative and one stimulative selection, eight had submitted two sedative selections and a further eight had submitted two stimulative selections. These twenty-five adults (18-59 years; 16 female/9 male) formed the sample for the study. Each individual had participated without an incentive and signed a declaration confirming that “he/she gave his/her (delete as appropriate) consent to participate, and is happy for his/her (delete as appropriate) reply, which will be kept anonymous, to be included in any publications or presentations of the results”.

Procedure

The participants had identified each selection with a random number (e.g. 24678). The codes and relevant details about each selection were written on the response form, and the form was sealed in an envelope to blind PFSM evaluations. The author set all the sealed response forms to one side, gathered together and shuffled the fifty CDs, and then taking each CD in turn determined if the PFSM could objectively confirm the participant’s selections of sedative music.

The author assessed music up to five minutes long in its entirety, and the opening five minutes of any selection over five minutes. The author determined whether or not the form, tempo, volume, texture, harmony, and melody of the music matched the definitions of predictability set out in the PFSM. The PFSM was constructed as a dichotomous tool with a yes/no scoring system. The author recorded one (‘1’) when the factor was predictable, and zero (‘0’) when the factor was unpredictable. The total PFSM score was calculated for each piece of music. The scores ranged from zero when there were no predictable factors to ten when they were all predictable. The author used the outcome of another strand of this doctoral research to identify that those selections that were categorised as sedative had a total PFSM score of between six and ten (Hooper, 2010). A second person assessed a randomly chosen sample (n=20) and confirmed the reliability of
the author’s PFSM scores. Spearman rho tests found a very strong significant positive correlation (ρ=0.890, n=20, p<0.01 (2 tailed)) between both sets of evaluations.

Two contrasting samples from the study are presented below to demonstrate how the PFSM was applied. The evaluations are presented as a passage of prose with predictable factors identified in brackets (melody-line), and as a table with the predictability and unpredictability descriptors used in each passage placed alongside a musical factor.

Sample 1 - Arvo Pärt’s “Spiegel im Spiegel” (EMI 7243 5 75805 2 5): A CD, randomly numbered 77773, contained music 8:18 minutes long. The author assessed the opening five minutes. The texture remained stable as a piano played rising triads, and a violin played a gentle unembellished line of rising and falling scales (texture; melody-line; melody-timbre; melody-pitch). There were moments when the melody and its accompaniment were accented to add expression to the composition (melody-accents), but otherwise the tempo remained slow (tempo) and any changes in volume were gradual (volume). Overall, there was a feeling of serene tranquility as a minimal musical style was combined with melodic repetition (melody-line) and harmony that followed a regular pathway of modulation (harmony). The blind evaluation identified nine predictable factors using the PFSM and categorised Arvo Pärt’s “Spiegel im Spiegel” as sedative.

Sample 2 - Björk’s “Violently Happy” (142tp7cdl): A CD, randomly numbered 24689, contained music 5:45 minutes long. The author assessed the opening five minutes. The dance beat driven music was energised by accents. It conformed to a verse/chorus structure (form), and was characterised by a repetitive melodic line (melody-line), a metronomic beat (tempo) and repetitive harmonic sequences (harmony). Apart from these predictable factors, there were clattering electronic effects that constantly disturbed the dance beat texture, introduced sudden changes in pitch and broke up an already harsh and disjointed vocal line. The blind evaluation identified only four predictable factors using the PFSM and categorised Björk’s “Violently Happy” as stimulative.
Table 2
Predictability and unpredictability descriptors used in two PFSM evaluations

<table>
<thead>
<tr>
<th>Musical Factor</th>
<th>77773</th>
<th>24689</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form</td>
<td>-</td>
<td>Verse/chorus</td>
</tr>
<tr>
<td>Tempo</td>
<td>Remains slow</td>
<td>Metronomic beat</td>
</tr>
<tr>
<td>Volume</td>
<td>Gradual changes</td>
<td>Clattering electronic effects</td>
</tr>
<tr>
<td>Texture</td>
<td>Stable (piano/violin)</td>
<td>Clattering electronic effects</td>
</tr>
<tr>
<td>Melody Line</td>
<td>Repetition</td>
<td>Hypnotic repetition</td>
</tr>
<tr>
<td>Melodic Timbre</td>
<td>Unembellished</td>
<td>Disjointed</td>
</tr>
<tr>
<td>Melodic Pitch</td>
<td>Gentle</td>
<td>Harsh</td>
</tr>
<tr>
<td>Melodic Accents</td>
<td>Rising &amp; falling scales</td>
<td>Sudden changes</td>
</tr>
<tr>
<td>Harmony</td>
<td>Regular modulation</td>
<td>Repetitive</td>
</tr>
</tbody>
</table>

Bolded words = predictability descriptors.
Lowercase italics = unpredictability descriptors.

Results

The participants submitted a diverse selection of music (see Appendix for full list). These are categorised and presented (see Table 3) by genre (column 1), and with the participant’s own categorisation of the music as either sedative (column 2) or stimulative (column 3). The outcomes of the blind PFSM evaluations are in parentheses. The PFSM allowed the rater to accurately assessed 100% of the sedative music and 84% of the stimulative music.
Table 3
*Outcome of blind evaluations of participant’s selections using the PFSM*

<table>
<thead>
<tr>
<th>Musical genre</th>
<th>Sedative selections</th>
<th>Stimulative selections</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classical (n=23)</td>
<td>11 (11)</td>
<td>12 (12)</td>
</tr>
<tr>
<td>Traditional folk (n=6)</td>
<td>3 (3)</td>
<td>3 (2)</td>
</tr>
<tr>
<td>Popular (n=21)</td>
<td>11 (11)</td>
<td>10 (7)</td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>25 (25)</td>
<td>25 (21)</td>
</tr>
</tbody>
</table>

A 2x2 contingency table (Table 4) shows how successfully the PFSM was used to identify sedative and stimulative choices (rows 2 and 3 respectively) and the number of pieces of music it categorised as sedative and stimulative (columns 2 and 3 respectively).

Table 4
*Performance of the PFSM raters in identifying the participant’s sedative and stimulative choices*

<table>
<thead>
<tr>
<th></th>
<th>Sedative categorisation</th>
<th>Stimulative categorisation</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>PFSM identified sedative</td>
<td>25</td>
<td>0</td>
<td>25</td>
</tr>
<tr>
<td>choices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>PFSM identified stimulative</td>
<td>4</td>
<td>21</td>
<td>25</td>
</tr>
<tr>
<td>choices</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Totals</strong></td>
<td>29</td>
<td>21</td>
<td>50</td>
</tr>
</tbody>
</table>

The author used Yates’s Continuity Correction to analyse this data because two cells were smaller than 5. The statistical significance of this small data set was not overestimated and results were more conservative. The effect of Yates’ correction yielded a highly significant value ($X^2_{Yates}=32.84$, df=1, $p<0.001$).

**Discussion**

This study evaluated whether or not the PFSM could be used to identify the participant’s sedative and stimulative choices. Blind PFSM evaluations were used to identify all the sedative selections, and although less successful with stimulative choices it was used to correctly evaluate all from the classical genre. The Yates’s Continuity Correction indicated that the
PFSM distinguished between sedative and stimulative music and confirmed the tool’s intrinsic validity.

The participants chose a diverse selection of classical music and the successful categorisation of music from several stages of its development and scored for different instrumentation demonstrated the value of devising a tool that assessed individual musical factors. For example, Sinding’s Rustle of Spring conveys the constant motion of excited springtime restlessness. This solo piano composition was categorised as stimulative (score of three) by identifying separate musical factors that included an unpredictable texture, accents conveying energy rather than expression and a harsh and embellished melody. Adams’ Short Ride in a Fast Machine was written for full orchestra, and it was categorised as stimulative because the PFSM supported the identification of the separate musical factors conveying the aural sensation of wrestling to control a powerful machine; constantly changing orchestral texture and sound, the energy of the harsh, accented, and broken melodic line, and dissonant harmony. Finally, in Vaughan-Williams’ The Lark Ascending, a fluid violin solo conveys an impressionistic image of the lark’s song and flight. While at times a highly embellished and angular solo, the The Lark Ascending was categorised as sedative (score of seven) because the PFSM identified separate musical factors that created a gentle and expressive orchestral work. This was exemplified in the way the violin emerged from and blended back into the texture, the restrained orchestration, and the controlled changes of tempo and volume.

The PFSM was used to correctly categorise all the classical music. However, it was also used to identify three stimulative popular music selections (Clor’s Love + Pain; DeGraw’s Chariot; Pink’s Who Knew) and one stimulating piece of traditional folk music as sedative (Flook’s Blackberry Blossom/The Independence). In general, stimulative music was distinguished from sedative by four of the five subsections of melody: embellished, accented, angular and harsh melodic lines. These four musical factors lowered the final PFSM score to six. At the score of five, music crossed over from being categorised as sedative to an ambiguous rating because it had five sedative and five stimulative factors and fell into neither the sedative nor stimulative category. Each of the stimulative selections categorised as sedative had the four unpredictable melodic elements that lowered the final PFSM score to six. However, they lacked the structural and textural complexities of Short Ride in a Fast Machine, or the dissonance and textural variety of Sinding’s Rustle of Spring, that would have lowered their PFSM score below an ambiguous categorisation to a score of four or less and a stimulative categorisation.

In addition to helping music therapists identify a sedative stimulus for receptive music therapy, the development of the PFSM may assist improvising music therapists. Improvisation are used to meet a client’s ‘in the moment’ musical needs. Each therapist has to manipulate elements such
as dynamics, rhythm, tempo and/or tonality so that the music moves and shifts with variability and flexibility. It is a great skill to be able to vary and balance musical elements in this way (Wigram, 2004). For example, although it is often relevant and empathic to create a dissonant frame when a client is playing random melodic material, the therapist needs to be aware that dissonance is a stimulating musical element, and dissonant music may not be effective empathically with a disturbed client and his/her upset feelings. The pulse of an improvisation also needs to be carefully managed. People with disabilities, affective disorders, illnesses and mental disturbance have often ‘lost’ a sense of pulse and tempo in their daily life, and this is reflected in their music (Wigram, 2004). In improvisation, the music therapist ought to be aware that breaking up rigid pulses or establishing a stable pulse affects people, and that s/he has to choose the stimulating effect of one and the sedative quality of the other depending on the needs of his/her client. These are just two examples of how the PFMSM may inform the music therapist’s manipulation of individual musical elements; it is not what they play but how they play it that is important (Wigram, 2004). Music therapists “need to learn how the balanced and effective use of (the different musical) elements can be made in a very sensitive and subtle way to engage and help patients” (Wigram, 2004, p. 216). The PFMSM has a role to play in this process. It can help improvising music therapists develop an understanding of how to manipulate separate musical factors and ensure more effective music therapy practice.

Finally, the PFMSM, like Grocke’s SMMA and Wigram’s lists before it, was developed for doctoral research. The use of the participant’s preferred music was not possible, as the author was introducing calming music to a group of people with an intellectual disability. The PFMSM generated a selection of music that reduced the mealtime agitation of those individuals under investigation (Hooper, Carson, & Lindsay, in press). More research is needed however. For example, research carried out by Tillman and Bigand (1996) and Lindström (1997) has determined that some musical factors effect perceived expression more than others, so perhaps the next step is to develop a weighted PFMSM scoring system that takes account of this research and gives greater importance to certain musical factors. Future investigations might try to eliminate erroneous categorisations of stimulative music as sedative by testing different scoring systems, or they might evaluate a greater number and wider range of compositions against the PFMSM to broaden the evidence that identifies an appropriate sedative stimulus for clinical and research settings.

Conclusion

The PFMSM provides a systematic method of analysis for identifying sedative music for use in receptive music therapy when individual choices
cannot be taken into account. It provides a first step in quantifying the
slippery and idiosyncratic concept of sedative music. As such it provides an
easily applied tool for clinical scenarios and will hopefully stimulate further
development of reportable music selection protocols.

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**Dedication**

This article is dedicated to the memory of Dr. Tony Wigram who oversaw these ideas first as consultant (2003-2009) and then as supervisor (2009-2010).
Appendix

Participant’s sedative music:

6. Björk, *All is full of love* – Homogenic, (4:47), TPLP71CD.
16. ArvoPärt, Spiegel im Spiegel (for violin and piano), (8:18), Spivakov (violin), Bezrodny (piano), ECM1591 449 958-2.
17. ArvoPärt, Spiegel im Spiegel (for violin and piano), (8:16), Little (violin), Roscoe (piano), EMI 7243 5 75805 2 5.
24. This Mortal Coil, *Song to the Siren* – It’ll end in tears, (3:35), CAD411.

**Participant’s stimulative music:**