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The development of a patient-oriented music intervention (POMI) for use in the adult intensive care unit: Acceptability to critical care experts

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Abstract

Background & purpose: *Pain is prevalent in the ICU at rest and during standard procedures. Clinical practice guidelines recommend a multi-modal approach to pain management, including pharmacological and non-pharmacological interventions. Music has been shown to be efficacious in reducing pain in this clinical setting when played for 20–30 minutes. A preliminary patient-oriented music intervention (preliminary POMI) was developed based on theoretical and empirical knowledge. We aimed to describe the acceptability of the preliminary POMI to critical care experts.*

Methods & procedures: *A descriptive design was used to address the study's aim. Purposive, snowball sampling was used to recruit participants who were ICU clinicians (i.e., seven nurses, one physician, one respiratory therapist, and one social worker) and music therapists (n = 3). Data were collected via video conference, using a six-item questionnaire and a semi-structured interview guide. Six attributes of acceptability were evaluated (appropriateness, suitability, convenience, effectiveness, risks, and undesirable effects), each rated from 0 (not acceptable) to 4 (most acceptable).*

Results: *Nine women and three men aged 27–68 years with 4–36 years of experience working with critically ill adults participated. All acceptability items had a median score ≥ 3 (range, 1–4). Participants highlighted the importance of taking into consideration the patient's music preferences and reported the use of streaming services as convenient. The timing of the intervention was more acceptable at rest or before instead of after a painful standard care procedure.*

Discussion & conclusion: *The preliminary POMI was found to be acceptable to critical care experts for ICU patients experiencing pain at rest. Minor modifications to the preliminary POMI are needed prior to testing the intervention for procedural pain in critically ill adults.*

Keywords: music, pain management, ICU, critically ill adult, nursing, acceptability

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Implications for nursing

- Clinicians, including nurses, play a key role in pain management as well as in the evaluation of innovative interventions. They evaluated the preliminary patient-oriented music intervention (POMI) as acceptable for use in the adult intensive care unit (ICU).
- Critical care experts highlighted the importance for critically ill adults admitted to the ICU to choose the type of music that they want to listen to. When unable to communicate these music preferences, family members should be invited to participate in the selection of the music on behalf of their loved one.
- Timing of the preliminary POMI is more acceptable either when the patient is at rest or in anticipation of a standard care procedure known to be painful.

Background and purpose

Pain continues to be prevalent in the adult ICU, both at rest and during standard care procedures, leading to the common use of opioids (Burry et al., 2014; Damico et al., 2020; Puntillo et al., 2014). Because of the safety concerns arising from opioid side effects and to optimize analgesia, clinical practice guidelines for pain management for critically ill adults recommend the use of a multi-modal approach, combining pharmacological and nonpharmacological interventions (Devlin et al., 2018). Music, as a complementary nonpharmacological intervention, can reduce pain by 1–2 points on a 0–10 numeric rating scale (NRS) for critically ill adults admitted to the ICU (Richard-Lalonde et al., 2020). Because patients are critically ill and unstable in the ICU, recommendations are to play music within a specific tempo range, such as 60 to 80 beats per minute, to match the recommended heart rate (Guétin et al., 2014; Poulsen & Coto, 2018). Music that is selected by patients produces greater pain relief than music that is pre-selected by researchers (Basinski et al., 2018, 2021; Dobek et al., 2014; Howlin & Rooney, 2021). However, many ICU patients are unable to communicate due to critical illness, mechanical ventilation, sedation, and neurological impairment (Dithole et al., 2016; Happ et al., 2011; Ten Hoorn et al., 2016; Yoo et al., 2020). In such cases, family members are often involved in decisions and communication on behalf of their loved one who is critically ill (Davidson et al., 2017). Furthermore, previous studies have found that some family members of patients admitted to the ICU are interested in contributing to nonpharmacological pain management (Gosselin & Richard-Lalonde, 2019; Richard-Lalonde et al., 2018). Therefore, the involvement of family members should be considered in the development of a novel music intervention.

Developing personalized music playlists with a pre-specified tempo can require extensive time and resources. However, in the ICU setting, there is limited time to create personalized

playlists due to several factors, such as patient sedation, procedural workload, restricted visitation hours, and limited resources (Gagné et al., 2018). At the same time, there is a growing use of music streaming services worldwide giving immediate access to an immense collection of music pieces along with their properties, such as tempo, valence, and arousal (Curry, 2022; International Federation of Phonography Industry, 2022; Spotify AB, 2023; Statista, 2019). Therefore, music streaming technology is an important avenue to rapidly generate individualized music playlists composed of pieces within a specific tempo range.

A preliminary version of a POMI was initially developed (see Table 1 and Supplementary Figure 1 for more details) by integrating theoretical and empirical knowledge, as proposed by Sidani and Braden (2011). Next, to produce a more comprehensive intervention, we sought to further refine the preliminary POMI by acquiring and integrating the experiential knowledge of health professionals with critical care experience. Thus, the goal of this study was to describe the acceptability of the preliminary POMI from the perspectives of critical care experts.

Methods and procedures

Design. This study used a descriptive design and employed both quantitative and qualitative methods to inform the acceptability of the preliminary POMI more fully. Recruitment began after institutional research ethics board (REB) approval (research ethics number: Project # 2020-2273).

Sample. Health professionals with at least three years of experience working with critically ill adults were eligible to participate (Benner, 2004). Twelve ICU clinicians (n = 10) and music therapists (n = 3, with one music therapist also being a bedside nurse) were recruited using a purposive and snowball sampling strategies. This sample size was estimated to be the point at which saturation would be likely to have occurred (Guest et al., 2006).

Table 1
Preliminary POMI Detailed Description

Item	Description	
Brief name	**Preliminary POMI (Patient-Oriented Music Intervention)**	**Refined Version of POMI**
Why?	The goal of the POMI is to use music to act multimodally to reduce pain in ICU adult patients, by targeting multiple dimensions of the pain experience (Guétin et al., 2014; Williams & Craig, 2016).	N/A
What and how (materials and procedures)?	Music is provided to adults admitted to the ICU either via headphones, earbuds, or by music pillow. Although headphones were efficacious in reducing pain in ICU patients who can self-report, some participants have withdrawn from random control trials (RCTs) due to their dislike of headphones, so they should be offered alternative options (Richard-Lalonde et al., 2020). The music offered should reflect the patient's preferences to be effective in pain management (Basinski et al., 2021; Basinski et al., 2018; Dobek et al., 2014; Guétin et al., 2014; Howlin & Rooney, 2021; Richard-Lalonde et al., 2020; Van Criekinge et al., 2019). This can best be accomplished via the use of streaming services, which is the form of music that is increasingly being used, and which gives the listener instant access to tens of millions of music pieces (Musical Pursuits, 2022; Spotify AB, 2019; Statista, 2015). Therefore, the preliminary POMI uses a Web-based tool (linked to Spotify) that can be accessible from any smart device, available at https://pomi.glitch.me (see Supplemental Figure for sample screenshot). The preliminary POMI is designed to be operated by ICU patients and/or family members in a critical care setting (with or without clinician assistance). It requires a limited amount of simple information regarding music preferences to create individually tailored music playlists, drawing from a music streaming service that holds over 80 million songs (Spotify AB, 2022). The generated music playlists tailored to the ICU patients' preferences are composed of pieces that range in tempo from 60 to 80 beats per minute (bpm), as per evidence-based practice recommendations (Poulsen & Coto, 2018).	Music is provided to critically ill adults admitted to the ICU either via headphones or music pillow for those patients able to self-report their preference. The music pillow is the option for patients unable to self-report.
Who provides, and where?	When admitted to the ICU, music preferences are established by the patient or the family (for patients unable to self-report). ICU patients self-administer the preliminary POMI to the extent that they can, with assistance from the family or healthcare providers if necessary. For ICU patients who cannot communicate their music preferences, a family member who has knowledge of their music preferences will act as a surrogate and select music on behalf of the patient.	N/A
When and how much?	A minimum of 20–30 minutes of music from the generated playlist is played either when the patient is at rest, or immediately after a patient undergoes a standard care procedure while admitted to the ICU. This duration is required to obtain an efficacious reduction in pain as evidenced by a recent systematic review (Richard-Lalonde et al., 2020).	Music from the generated playlist is played either when the patient is at rest, or ideally before a patient undergoes a standard care procedure while admitted to the ICU.

Preliminary POMI. The features of the preliminary POMI were determined based on theory and evidence drawn from the literature, including a systematic review and meta-analysis that we conducted on the effect of music on pain in adult ICU patients (Richard-Lalonde et al., 2020). The psychophysiological model of music and pain proposes that music modulates pain multimodally (Guétin et al., 2014; Guétin & Touchon, 2018). More specifically, music acts on the sensory dimension of pain by reducing the pain sensation via the activation of descending pathways of the modulation process (Guétin et al., 2014; Guétin & Touchon, 2018). Music is also proposed to act on the cognitive dimension by diverting attention away from the painful stimulus (Guétin et al., 2014; Guétin & Touchon, 2018). In addition, music can act on the emotional dimension of pain via emotional regulation, leading to a less distressful pain experience (Guétin et al., 2014; Guétin & Touchon, 2018). Behaviourally, music reduces muscle tension, which is a common indicator of pain (Guétin et al., 2014; Guétin & Touchon, 2018). Psychosocially, music promotes communication between patients and caregivers, such as through the discussion and consideration of the patient's music preferences (Guétin et al., 2014 ; Guétin & Touchon, 2018). The preliminary POMI is described in Table 1, as per the TIDieR guidelines (Hoffmann et al., 2014).

Study context. The study protocol was initially submitted to the REB in March 2020. Due to the COVID-19 pandemic, all non-COVID-19 research was suspended in the ICU where the study would have been conducted in person, with patients, family members and clinicians. Therefore, we modified the research protocol for the study to be conducted online only with ICU clinicians and music therapists, thus excluding patients and family members, who could no longer be recruited at that time. The study was approved in December 2020, and we recruited participants and collected data from January to March 2021.

Data collection. Once recruited, one-on-one virtual conference meetings were scheduled (Zoom Video Communications, Inc., Version 5.5.1), where a brief presentation of the preliminary POMI was given. Then, participants answered a sociodemographic questionnaire and a six-item treatment acceptability questionnaire (TAP), followed by a semi-structured interview on the acceptability of the preliminary POMI. Acceptability was evaluated on six attributes (appropriateness, suitability, convenience, effectiveness, risks, and undesirable effects), each rated 0–4 with 0 being not at all acceptable and 4 being very much acceptable (Sidani et al., 2009; Sidani & Fox, 2020). Because pain in the ICU is known to occur at rest and following standard care procedures, each TAP item was evaluated for the preliminary POMI being administered to a patient at rest and following procedures.

The semi-structured interview guide (see Figure 1) included questions addressing the responses on the TAP, in addition to asking feedback on preliminary POMI features (e.g., duration, mode of delivery, etc.).

Figure 1

Semi-Structured Interview Guide

1. What makes the POMI acceptable/unacceptable? (10 min)
    a. … appropriate or not appropriate to address pain?
    b. … suitable or not suitable for the ICU?
    c. … effective or ineffective in reducing pain?
    d. What makes you be willing or unwilling to use the POMI?
    e. Were you familiar with the music proposed in your playlist?
2. Which risk/undesirable effect (if any) might arise from the use of the POMI? (5 min)
3. What is your opinion of the following POMI features? (20 min)
    a. Ability to select music based on personal preferences (genres, tracks, artists)
    b. Use of streaming service (ability to create a playlist; to pause; to skip tracks)
    c. Playing music for a duration of 20 to 30 minutes
    d. Playing music immediately after a painful procedure vs. at rest (when in pain)
    e. Use of headphones to deliver the music vs music pillow
    f. Assistance from family to select music preferences
    g. Assistance from clinicians to use POMI web-based tool
4. What do you like least about POMI? (5 min)
5. What do you like best about POMI? (5 min)
6. What could be done to improve POMI? (5 min)

Data analysis (quantitative data). Descriptive statistics were computed to describe the demographic characteristics of the participants and to summarize the acceptability questionnaire data using the software IBM SPSS Statistics for Windows, Version 23.0. Due to the small sample size, medians and interquartile ranges (IQR) were calculated for continuous variables such as age. Frequencies and percentages were calculated for categorical variables such as gender. For the TAP, median and IQR were calculated for each item, as well as the frequency and percentage of participants who rated the acceptability at least three out of four. The preliminary POMI was considered acceptable if at least 80% of the respondents rated each item at a 3 or 4 (acceptable or very much acceptable) on the acceptability rating scale.

Data analysis (qualitative data). Video recordings of interviews were transcribed as follows. The audio portion was transcribed verbatim by the first author (MRL), who also noted any relevant nonverbal expression from the video portion of the recording. Content analysis was performed by MRL and CG using an unconstrained deductive coding scheme (Elo & Kyngas, 2008). To begin with, transcripts were analyzed deductively by coding relevant data content into pre-determined categories based on the interview guide, including acceptability items (appropriateness, suitability, convenience, effectiveness, risks, and undesirable effects) and POMI features (e.g., duration, mode of delivery, music characteristics). Subsequently, transcripts were analyzed inductively, so that any emerging ideas that did not fit into the pre-determined categories were coded and then used to develop new categories (Elo & Kyngas, 2008, p. 112). Codes were identified, highlighted, and organized into categories using QDA Miner (version 5.0) software. Participants were given pseudonyms to protect confidentiality, and identified as either a clinician (i.e., nurse, physician, respiratory therapist [RT], social worker) or music therapist.

Results

Descriptive analysis. Table 2 describes the sample characteristics. Nine women and three men participated in this study, with a mean age of 42 years old (SD, 13). Participants included music therapists (n = 3), bedside nurses (n = 6, with one bedside nurse also being a music therapist), nurse educator (n = 1), physician (n = 1), respiratory therapist (n = 1), and social worker n = 1), with a mean of 15 (SD, 9.5) years of professional experience working in a critical care setting. At the time of the interview, participants worked either in Canada, France, or the United States of America. The descriptive results for the TAP questionnaire are reported in Table 3.

Table 2

Participant Characteristics

Characteristics	*n* (%)
Gender	
Woman	9 (75)
Man	3 (25)
Profession	
Clinician with no music therapy training	9 (75)
Music therapist	3 (25)
Prior Use of Streaming Services	
Yes	11 (92)
No	1 (8)
Prior Use of Music with Patients	
Yes	10 (83)
No	2 (17)

Note. Participants had a median age of 43 years old (IQR = 21) with a median of 11 years of experience working in a critical care setting (IQR = 15.5); IQR = interquartile range.

Table 3

Treatment Acceptability Preferences Questionnaire Results

Question	Median (IQR) Scores		% Participants who rated ≥ 3	
	At rest	Post procedure	At rest	Post procedure
1. Does the music intervention seem appropriate (logical) to address pain?	4.0 (0.5)	3.5 (1.5)	100	67
2. Is the music intervention suitable for the intensive care unit setting?	4.0 (1.0)	3.0 (1.5)	92	58
3. How willing would you be to support/assist with this music intervention?	4.0 (0.0)	4.0 (0.0)	100	100
4. In your opinion, how effective would the music intervention be in reducing pain?	3.0 (1.0)	4.0 (1.0)	100	100
5. How would you rate the presence of risk involved in the use of this intervention?	3.5 (2.0)	3.0 (2.0)	75	67
6. How would you rate the presence of undesirable effects caused by this intervention?	3.0 (1.5)	3.0 (2.0)	75	75

Note. IQR = Interquartile range; questions 5 and 6 were reverse coded so that higher values represent higher levels of acceptability.

Content analysis. Content analysis was based on the qualitative analysis of the interview transcripts. The categories included the items of the TAP questionnaire (appropriateness, suitability, effectiveness, convenience, and risks/undesirable effects), the use of a music streaming service, duration, timing, mode of delivery, ability to control the music, the role of family, the role of clinician, standardized playlist, as well as the ICU environment.

Appropriateness. All participants rated the intervention as appropriate (at least ¾) to address pain when administered at rest. One participant explained: "les gens sourient, les gens sont décontractés, quand ils aiment la musique, et vous allez voir tout de suite, je pense" ["people smile, people are relaxed, when they like the music, and you will see that right away, I think"] (participant "Charlie", clinician). Four participants (33%) considered the intervention as less appropriate (ratings <3/4, with 2/4 as lowest score) if administered following a standard care procedure known to be painful. Reasons given were the anticipated difficulty in coordinating with standard care procedures (n = 2) and the likelihood that a patient prefers to not be stimulated after a procedure (n = 2): "sometimes after a procedure, you just want to be left alone, without any outside stimulation" (participant "Kim", clinician).

Suitability. Eleven participants (92%) rated the intervention as being suitable for the ICU setting when administered at rest, apart from one participant. This participant recommended to modify the intervention by controlling the tempo progression so that the tempo should slow down gradually (i.e., from 80 bpm to 60 bpm, as the playlist progresses) and to increase the duration of the intervention to at least 35–45 minutes, instead of 20–30 minutes, for the intervention to be suitable for the ICU. Five participants (42%) rated the intervention to be less suitable (ratings <3/4) when administered after a standard care procedure known to be painful because of anticipated timing issues (n = 2) and expectation that a procedure would increase pain to a level that is too high to want to listen to music (n = 3): "after the procedure, the damage is done" (participant "Kim", clinician).

Convenience. Regarding the willingness to support/assist in providing the intervention, all participants reported the rated intervention as being acceptable (scores ≥3 out of 4) both at rest and post-procedure. One participant shared : Oui, je l'appuierais [POMI]. Je sais qu'il… y aurait beaucoup d'étapes, là, compte tenu de nos logiciels, en ce moment au (lieu de travail), mais ça serait probable. Je laisse déjà mon identifiant [d'employée] dans les chambres des patients pour [que le patient ait accès à l'ordinateur qui joue la musique]. [Yes, I would support [POMI]. I know that… there would be several steps, taking into consideration our software, at the moment, at [the hospital where I work], but it would be probable, I already leave my [employee] ID in the patient room for [the patient to have access to the computer that plays the music].] (participant "Drew", clinician).

Effectiveness. Regarding the anticipated effectiveness of the intervention, all participants reported the intervention as being acceptable (scores ≥3 out of 4) both at rest and post-procedure. One participant explained : "Dans les deux cas, je dirais que je pense que c'est un potentiel important, au moins 3 [sur 4]. Par contre, combien ça pourrait atténuer une douleur ? J'aurais tendance à penser que ça atténuerait moins pendant une procédure qu'au repos" ["In both cases, I would say that I think it has good potential, at least 3 [out of 4]. However, how much could it attenuate pain? I would tend to think less so during a procedure than at rest"] (participant "Charlie," clinician). One participant refused to answer the question on effectiveness because she did not feel qualified to provide an answer.

Risks and undesirable effects. The most frequently reported risks and undesirable effects were the undesired emotional reaction to music (n = 7); pressure sores/pain caused by headphones (n = 5); cross-contamination because of shared equipment between patients (n = 4); and too many wires (linked to headphones or pillow) in a setting that already has many (n = 4). When referring to the risk of an undesired emotional reaction, one participant stated that "[a patient] can hear a song that might bring up emotions that [they] weren't anticipating or expecting … or for someone who's had traumatic experiences, a song or a piece of music might trigger that traumatic experience… [With the POMI], patients have control of the app, which allows them the choice of music [and] giving patients the power of choice helps to minimize this risk" (participant "Jay", music therapist).

Use of a music streaming service. Several advantages were reported about the use of a music streaming service, such as the accessibility to a vast selection of music, allowing it to accommodate the patients' preferences, regardless of age or culture (n = 9). Another advantage noted by participants was the ability to play music continuously without having ads interrupt the intervention (n = 3). Reported technical constraints included needing to have access to Wi-Fi (n = 8) and to be familiar with the technology (n = 6).

Duration. All participants reported that 20–30 minutes of music was an acceptable duration, with 10 out of 12 participants (83%) stating that a longer duration would be acceptable, depending on the individual patient preferences: "I could see other people wanting more, and I could see people that I've worked with who would say 'No; 20 to 30 minutes is good' or 'Nothing'" (participant "Ezra", music therapist).

Timing (rest versus post-procedure*)*. Nine participants (75%) reported that providing the intervention after a standard care procedure known to be painful would not be as optimal as providing it before the procedure:

> *Je verrais encore plus l'effet si on le faisait avant. Là, je le sais, au niveau recherche, c'est plus challengeant, là, mais dans la pratique clinique, je me demande si ça serait pas plus pertinent de le faire quasiment avant que après… parce que si l'idée c'est de libérer les endorphines, j'ai l'impression que de les avoir avant, dans ton corps, avant la procédure douloureuse, ça va diminuer le pic de douleur [I would see the effect even more if [the intervention] was done before. I know that for research, it's more challenging, but in clinical practice, I wonder if it wouldn't be more pertinent to do [the intervention] before instead of after… because if the idea is to release endorphins, I think that having them before, in your body, before the painful procedure, that will reduce the pain peak…]* (participant "Alex", clinician).

Mode of delivery. Six participants (50%) reported a preference for the music pillow "I find the pillow very impressive … it frees you up from having one more thing on your body, in the ICU" (participant "Hayden", clinician), especially for the patients unable to communicate: "I think the pillow would probably be more comfortable … we have patients who are comatose… and I think the pillow would be more appropriate with them" (participant "Inali", clinician). Others preferred the use of headphones ($n = 4$) "I like to make sure that I'm blocking out, especially in an ICU, because they're kind of noisy, that we're blocking out that sound because then it enhances the music listening experience" (participant "Jay", music therapist). On the other hand, earbuds were reported as being most problematic (i.e., risk of getting lost, least comfortable option, difficult to clean properly) and, therefore, less acceptable in an ICU setting. Two participants had no preference with regard to the mode of delivery of the POMI.

Ability to control the music. Eight participants (67%) mentioned the importance for the patients to have control over the music intervention:

> *C'est le contrôle qu'on donne aux patients. Moi j'y crois beaucoup que c'est important. Les patients, ils [n'ont] de pouvoir sur rien aux soins intensifs. Si au moins, ils pouvaient avoir un petit peu de pouvoir qu'on peut leur donner l'autonomie, ça nous permet de mieux les connaître, il y a toutes sortes d'autres avantages que la douleur. Pour l'avoir testé [l'utilisation de la musique] sur plusieurs patients, souvent, ça diminuait aussi leur anxiété, pis ça a diminué leur douleur pour la plupart, aussi. [It's the control that we give patients. I strongly believe that this is important. The patients, they have no power over anything in the ICU. If, at least, they could have a little bit of power that we could give them, this allows us to get to know them… Having tested [the use of music] on several patients, often… it reduced their pain, for the majority]* (participant "Alex", clinician).

Family role. All participants agreed that asking the family about their loved one's music preferences is acceptable when the patient is unable to communicate their preferences. Three participants (25%) noted that the music intervention could also be helpful to the family, either because they could also listen to the music, or because they could feel comforted if the music intervention was beneficial to the patient. One ICU nurse shared the following story that happened on her unit, when a family member was not consulted in the music selection of the patient admitted to the ICU:

> *C'était un patient … incapable de communiquer… Fait que nous, on lui mettait des chansons sur YouTube, tsé des listes, pis ça part, un vidéo entraîne un autre vidéo, pis ça continue, et sa conjointe, qui était dévastée, déjà, [par l'état de santé du patient], elle arrive, et c'est genre le groupe qu'il déteste le plus au monde qui joue, … je pense qu'elle, ça l'a fait flipper, parce qu'elle … c'est la seule affaire qu'elle contrôle, dans toute l'expérience… fait que c'était pas, rien de grave, le patient, lui, il peut pas nous communiquer à ce moment-là, mais l'effet que la famille a ressenti comme si on le prenait pas en considération… il n'y a pas eu, rien n'est arrivé au patient, c'est juste une espèce de situation avec la famille, là… ça les a un peu déçu… [This was a patient who… was unable to communicate... So, we were playing some songs on YouTube, you know playlists, they start, and then one video leads to another, and it goes on… and his partner, who was devastated already [by his state of health], arrives in the room, and it's the [music] band that [the patient] hates the most in the world, you know… I think that made her flip, because … it's the only thing she can control, in the whole event… so it's nothing too serious, the patient, he cannot communicate at this time, but the impact that the family felt was as if we did not take him into consideration… nothing happened to the patient, it's just a sort of situation with the family that… they… were a bit disappointed, you know.]* (participant "Drew", clinician).

On the other hand, another ICU nurse shared a different personal experience that occurred when a family member requested personalized music for a patient admitted to the ICU in an end-of-life context:

> *La semaine passée, je faisais des soins de conforts palliatifs à un patient aux soins intensifs, et la conjointe m'a demandé si c'était possible de mettre de la musique de préférence du patient pendant le moment où il décédait... Pis lui, ce qu'il aimait, c'était le death métal, ok? Fait que, est-ce que c'était un peu spécial d'avoir du death métal au chevet du patient pré-mortem? Tout à fait! Mais la conjointe était vraiment satisfaite, et le patient était très satisfait lui aussi. Ça fait que, perso, je pense que c'est très, très intéressant comme intervention. [Last week, I was giving comfort care to a patient in the ICU, and the partner asked me if it would be possible to play music preferred by the patient at the time that he wouId die... What he liked was death metal, right? So, was it a bit special to have death metal at the bedside pre-mortem? Absolutely! But the partner was really satisfied, and the patient was really satisfied too. So, personally, I think this [POMI] is a very, very interesting intervention.]* (participant "Blake", clinician).

Clinician role. Although all participants reported being willing to support/assist in providing the intervention, eight (67%) suggested that clinicians be trained to do so, or that a document be created of the steps for clinicians to know how to administer the intervention. Five participants (42%), including all three music therapists, recommended that clinicians assess and follow-up with patients during the music intervention in case of the need to readjust the music (either by stopping or changing the music being played) based on the patient's response:

> *We should, if we're putting music on someone we do want to observe their response to it, especially if they don't have words or can't communicate. What are we seeing in their behaviour? Even if it's 'they're grimacing' or we're seeing tears, then we should pay attention to that. I think that we certainly don't want to overstimulate someone if they're already in a very fragile state, so I think it's really important that we don't just put something on and then we just walk away" (participant "Jay", music therapist) and "it's like a debrief: 'how was that for you? … I noticed that you seem sad, is that [so]?'"* (participant "Ezra", music therapist).

Four participants (33%) raised the idea that the music could also be beneficial to clinicians and lead to improvement in the

clinician-patient communication. On the other hand, two participants (17%) mentioned that in their experience, clinicians sometimes prefer to listen to music that is different from their patients' preferences. Thus, the patients' music preferences may not always match the clinicians' preferences.

Standardized playlist. Nine participants (75%) stated that they would like to have an option for a "standard-type" playlist that they could use with patients whose music preferences were unknown:

> *My concern with ICU population is that most of them will be sedated paralyzed, most of them will not be able to voice their preference, and I was wondering if there is some universal tune or universal type of music, like one size fits all. So, if we could find this, that would be amazing*" (participant "Kim", clinician), and also:

> *Je ne pense pas que d'imposer, c'est nécessairement bon. Par contre, quand on est dans l'impossibilité de demander l'avis des patients, il faudrait peut-être que ce soit quelqu'un qui choisisse pour eux autres, à ce moment-là, et de voir, peut-être, la réponse au choix qu'on a imposé et essayer un autre choix si on voit que ça ne fonctionne pas; peut-être qu'on n'est juste pas tombé sur le bon à ce moment-là [I don't think that it's necessarily good to impose [a type of music]. However, when we are unable to ask the patients' opinion, maybe it should be someone that chooses for them, in that case, and to see, maybe, the response to the choice that was imposed, and try another choice if we see that it doesn't work; maybe we just didn't find the right one at this specific moment in time…]* (participant "Leslie", clinician).

ICU environment. Seven participants raised the notion that the ICU is known to be a noisy, distressful environment, and preferred music can help palliate this situation by creating a more familiar environment for the patient:

> *Il y a aussi un enjeu de ramener, un peu, du contexte naturel de la personne dans ses soins, parce que, mine de rien, chez nous, moi je vais pas rester là en train de faire, mettons, je sais pas; si je vais au fauteuil pendant toute la journée, ben je vais pas regarder le mur pendant toute la journée. Fait que d'avoir de la musique, c'est certain que ça rapproche le patient d'un contexte un peu plus naturel… il y a un peu d'humanité là-Dedans; de retrouver un peu de la personnalité de la personne, pis lui donner un peu de choix dans son environnement; d'avoir un environnement familier; un environnement où elle se sent un peu plus « at home »; fait que ça, c'est peut-être un point que je trouve qui est bien. [There is also the issue of bringing back a little bit of the person's natural context in their care because, it may not sound like much but, at home, I am not going to stay there…if I am going to sit on a chair all day, well I'm not going to stare at the wall all day. So having music, for sure, brings the patient closer to a more natural context… there is a bit of humanity in there; to recover a bit of the person's personality and give them some choice in their environment; to have a familiar environment where they feel a bit more at home]* (participant "Blake", clinician).

> *Je trouve que, [la musique], c'est plus présent maintenant, depuis mars [2020]... Je pense que c'est vraiment le fait que nos patients … n'ont pas de famille, pas de visite, nous on va moins les voir aussi, ils ont moins de consultants qui rentrent dans les chambres. Donc, oui, j'ai l'impression que pour pallier à ça, les infirmières ont commencé à utiliser la musique. [I find that [music] is more present now, since March [2020] … I think that it's really because our patients… have no family, no visit, we don't go in to see them as often, there are fewer professionals entering their rooms. So yes, I get the impression that to palliate this, nurses have started to use music]* (participant "Drew", clinician).

Discussion

More than 80% of participants rated the preliminary POMI as acceptable when provided to patients while at rest. In contrast, some participants found it to be unacceptable if provided immediately after a standard care procedure known to be painful. Instead, participants reported that the intervention should be provided before a standard care procedure known to be painful, in line with current clinical practice guidelines and preventive analgesia in anticipation of a noxious stimulus (de Jong et al., 2013; Devlin et al., 2018; Vadivelu et al., 2014).

To mitigate the risks and undesired effects that were noted, participants recommended that a strict disinfection protocol should be in place and approved by the infection prevention and control department when the material is shared among patients; for example, medical-grade disposable headcovers can be used for headphones. Additionally, participants advised that those who administer the POMI to ICU patients should pay attention to any undesired reaction (e.g., grimacing, crying) to the music and adjust the intervention, if needed, by either changing the type of music or stopping it. Participants recommended that patients should always be given as much control over self-administration of the intervention, to the extent that is possible in the context of critical illness. Finally, participants suggested that wireless options should be prioritized when possible and the music pillow utilized over headphones for patients unable to communicate to reduce the risk of pressure injury and/or discomfort due to wearing headphones.

Giving patients the ability to control the music selection and delivery (i.e., self-administration, when possible, to promote a sense of control) was considered by participants as an important feature of the preliminary POMI. This is in line with what is reported in the literature in other clinical settings, where the perception of control in music selection can increase the analgesic effect (Howlin & Rooney, 2021; Howlin et al., 2022). Related to this, participants agreed that an important criterion for acceptability of the preliminary POMI is that the music selection should be congruent with individual patient preferences. More specifically, the music played should be what the patient wants to hear in the moment, as defined by the individual, which can be specified in terms of genre, artists, specific pieces, and/or music characteristics, such as valence (emotion, ranging from negative to positive, perceived as being encouraged by the music, e.g., melancholic versus cheerful), and arousal (energy). Studies on the use of music listening interventions for pain management have found that sometimes, patients want to listen to "low energy" music (e.g., a Bach prelude) while in other cases, patients prefer "high-energy" music, such as death metal, which can be different from what some clinicians might expect (Howlin & Rooney, 2020; Howlin et al., 2023).

This is also in line with the literature that preferred music characteristics play an important role in pain reduction (Basinski et al., 2018; 2021). Related to this, some participants proposed that the preliminary POMI should not only ask what music the patient would like to listen to (i.e., to know what to add on to the individualized playlist), but also what music the patient does not want to listen to (i.e., to know what to remove from the individualized playlist). For ICU patients unable to communicate their preferences, participants supported the involvement of family members in determining the patient's music preferences.

Regarding clinician involvement in the provision of the preliminary POMI, participants suggested the option of having a standard playlist as a desirable addition to the intervention. However, participants specified that such a pre-specified playlist should only be considered when the patient is unable to communicate their preferences, and there is no one (e.g., family member) who knows and can communicate the patient's music preferences with the care team. Standard playlists have been used in research, and there is some evidence that these can also be effective in reducing pain in adult ICU patients (Richard-Lalonde et al., 2020). However, to date, there is insufficient data to support the use of standardized music characteristics to objectively produce analgesia (Martin-Saavedra et al., 2018). Therefore, more research is needed to determine the possibility of developing such standardized music playlists for pain management purposes and to determine for whom this type of standardized playlist would work.

In this study, participants agreed that the use of smart devices to provide the intervention was acceptable. This is consistent with findings from a previous study in which the use of an electronic tablet was found as acceptable and feasible as a mode of delivery to provide music in the ICU setting (Knudson et al., 2018).

According to the theoretical framework used to guide the development of the POMI, music modulates pain multimodally by acting on the sensory, cognitive, emotional, behavioural, and psychosocial dimensions (Guétin et al., 2014; Williams & Craig 2016). Many of the categories related to POMI discussed by participants in this study, drawn from their personal perspectives, can also be linked with how music is proposed to act on the different dimensions of pain, both theoretically and empirically.

More specifically, most participants in this study agreed that a wide range of music choices using a music streaming service was an important component of the preliminary POMI, allowing access to a wide range of music choices. This is consistent with theoretical and empirical evidence that preferred music (i.e., based on individual preferences) acts on the emotional (affective pathway) and cognitive (redirection of attention) dimensions of pain (Basinski et al., 2021; Guétin et al., 2014; Villareal et al., 2012). In addition, several participants in this study mentioned the importance of giving patients more control in the selection of music to increase the efficacy of the music on pain. Providing such control to patients has also been reported in the literature as modulating pain via cognitive and emotional processes (Garza-Villarreal et al., 2017; Guétin et al., 2014; Howlin & Rooney, 2020).

The relaxation of facial expressions that occurs when listening to music, as reported by some participants, is consistent with the behavioural dimension of pain, whereby music acts on muscle tension, as proposed in the theoretical framework and further evidenced by empirical data (Guétin et al., 2014; Tan et al., 2010; Van Criekinge et al., 2019).

Participants in this study proposed that the POMI should be used to address procedural pain by timing the intervention prior to the procedure in anticipation of the painful stimulus. This use of music to pre-emptively decrease the pain intensity peak is analogous to pharmacological approaches to procedural pain management and pertains to the sensory dimension of pain, by which music attenuates the sensation of pain (Devlin et al., 2018; Guétin et al., 2014).

Participants in this study also reported on the use of music to improve the clinician-patient-family relationship stating that music could also be beneficial to family and clinicians, provide a more comfortable environment, and palliate the social isolation from the pandemic context in the ICU. These reported perspectives fit directly with the psychosocial pathway through which music is proposed to modulate pain by promoting communication and encouraging communication between patients and caregivers (Guétin et al., 2014; Guétin & Touchon, 2018). Thus, in addition to the sensory, emotional, cognitive, and behavioural dimensions of pain, the POMI could be used to target the psychosocial dimension of pain by improving the caregiver-patient communication, providing a more comfortable, familiar environment, and reducing the feeling of isolation. This is especially relevant in the context of the COVID-19 pandemic, as well as in other situations (e.g., due to infection or immunosuppression), where patients tend to be more isolated and stay longer in the ICU (Rivi et al., 2021).

Limitations

The participants in this study were limited to clinical experts who volunteered. We could not recruit ICU patients and family members because of the COVID-19 pandemic context at the time of the study. Therefore, the protocol was adapted, and the acceptability of the preliminary POMI was assessed only by clinical experts. However, in the next steps, ICU patients and families will be asked for their input on the acceptability of the refined preliminary POMI, as part of the pilot testing that will follow this study (Richard-Lalonde et al., 2023).

Conclusion

The preliminary POMI was found to be acceptable to participants for ICU patients experiencing pain at rest. Based on the feedback of the participants, modifications will be made to refine the preliminary POMI, including administration of the intervention before, instead of after, standard care procedures known to be painful. The refined preliminary POMI will be pilot tested in the adult ICU to describe the perspectives of not only clinicians but also patients and family members of patients unable to self-report.

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Supplementary Figure

Screenshot Sample of Web App for POMI