

# FINDING NEW MUSIC: A DIARY STUDY OF EVERYDAY ENCOUNTERS WITH NOVEL SONGS

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## ABSTRACT

This paper explores how we, as individuals, purposefully or serendipitously encounter “new music” (that is, music that we haven’t heard before) and relates these behaviours to music information retrieval activities such as music searching and music discovery via use of recommender systems. 41 participants participated in a three-day diary study, in which they recorded all incidents that brought them into contact with new music. The diaries were analyzed using a Grounded Theory approach. The results of this analysis are discussed with respect to location, time, and whether the music encounter was actively sought or occurred passively. Based on these results, we outline design implications for music information retrieval software, and suggest an extension of “laid back” searching.

## 1. INTRODUCTION

A variety of information sources and systems are available to support people in locating music: artist and music review websites, music recommender systems (for example, Pandora, and Last.FM), music databases, even general purpose search tools such as Google. However, there has been relatively little research to date on how people encounter new music ‘in the wild’—that is, the formal and informal ways that they search, browse, borrow, overhear, discuss, recommend, and otherwise run across music that they are unfamiliar with. We argue that a rich understanding of behavior related to finding new music can inform the refinement of existing MIR systems. In this paper, we describe a diary study conducted to begin building that rich understanding.

As noted above, relatively little related work has been reported in this area. Two earlier studies also use a diary study methodology to examine the impressions people have of everyday music encounters: one formal [2] and the other informal (an online survey conducted by the BBC1<sup>1</sup>). Both focused solely on ‘intrusive music’ that participants heard but had no control over playing—for example, music played in retail environments. This paper extends that work by broadening the scope to all encounters with new music, both music that is purposefully sought by and that which is thrust upon the

participants. We relate the findings of this prior work to our analysis in Section 3, Results and Discussion.

## 2. METHODOLOGY

A diary study methodology was chosen to gather real-life experiences of encounters with unfamiliar music. Diary studies are particularly useful in capturing the “little experiences of everyday life” [7]; participants literally fill in a diary detailing their activities, thoughts, and feelings for the topic or task that is the focus of the study. The diary provides a record of events as they actually occur, rather than the retrospective (and sometimes faulty) recollections provided by, for example, surveys and interviews. A diary study can also allow the researchers to examine a relatively longitudinal record of behavior (over the course of time that the diary is maintained) [1].

Participants for this study were drawn from a third year university course on Human-Computer Interaction. The diary study was an initial step in a semester-long project to design and prototype a system that would support the user in locating interesting new music. A total of 41 students were charged with the task of maintaining a diary for three days, recording each incident in which they encountered music that was unfamiliar to them.

| Gender     | Count (%)     | National Origin | Count (%)  |
|------------|---------------|-----------------|------------|
| Male       | 33 (80.5%)    | NZ              | 17 (41.5%) |
| Female     | 8 (19.5%)     | China           | 17 (41.5%) |
|            |               | Other Asian     | 4 (9.6%)   |
|            |               | Other           | 3 (7.3%)   |
| Age range: | 20 – 37 years | Average age:    | 22.8 years |

**Table 1.** Demographic details of participants

To preserve anonymity, each participant is referred to with one or two randomly assigned letters of the alphabet (e.g., [G] or [BB]). Table 1 summarizes the gender, age, and national origin of the participants. The participants are representative of tertiary IT students: the group is dominated by male participants, the majority are school leavers who went straight to university or at most took a gap year, and the high Chinese demographic is characteristic of IT courses in New Zealand.

We are aware that this study documents the behavior of a narrow demographic (one which is more likely than

the general population to use electronic media for music discovery), however, at the time of the study it was not feasible to recruit a sizable sample of other participants, and, for reasons outlined below, other participants may have produced lower-quality results

The diary consisted of a paper template. For each incident in which novel music was encountered, the participants were requested to record: the time and date; their physical location; a description of the activity or circumstance that led to their hearing the music; and any comments that they had about the incident (for example, whether or not they liked the music). A total of 409 data entries were recorded.

Diary entries in such studies tend to be terse—the ones in our study averaged 28.7 words in length—consequently participants are typically interviewed after the diaries are completed, to flesh out the event descriptions. For ethical reasons we waited until after the end of the semester before using the diaries as research data, however this meant it was not possible to schedule de-briefing interviews. Instead, the students were asked to write a 1–2 page report summarizing their diary entries. These reports were used to guide the research analysis in the interpretation of the diary data.

Diary studies are known to have limitations beyond those of other qualitative data gathering techniques such as interviews and surveys [1]. Most significant is the relatively high level of effort required of participants, to create detailed and comprehensive records of their activities leading to an attrition rate in participants over time. Because the students involved knew that they would be using the data collected in their own diary as part of the requirements gathering for a subsequent prototype, we posit that they had a stronger sense of commitment to the diary process and deliberated more over writing entries than typical diary study participants. For the same reason (that the diary was part of a graded project), attrition was not a problem for this research. Compliance can also be improved by reducing the burden of data entry for the participant: in this case by limiting the diary period to three days, and by requesting as few details about each incident as is practical. The diary design was also intended to minimize under-reporting: a template prompts the participant to describe each of the aspects of interest.

Reactance—a change in participants’ behavior as a consequence of participation in the study—is of concern in diary studies [1]. The students noted that during the study they were more consciously aware that they were hearing new music, although it is not clear that this actually affected their activities leading to actual exposure to new music:

*The serendipitous examples in the diary, I would argue, only came into my conscious mind because I knew I was going to have to report on them. On an average day I would not register what was playing on the radio ... [it] is on as background noise. [L]*

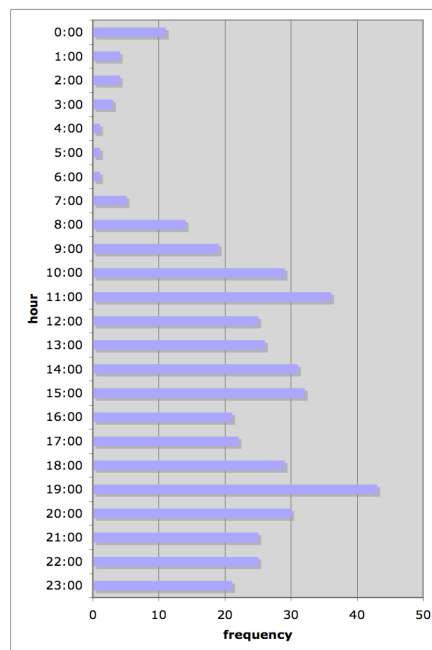
However, other portions of the requirements gathering for their projects almost certainly did alter their behavior. Specifically, it is probable that some

reported uses of online music recommendation systems (for example, Pandora and Last.FM) occurred as a result of a requirement, for another part of the course, to critique an existing recommender system.

A Grounded Theory approach was used to analyze the diaries and the participants’ summaries of their behavior [3]. Grounded theory is particularly well suited to analyzing this type of data, because it allows patterns to emerge from data where no hypotheses exist. A grounded theory analysis involves identifying possible areas of similarity, and ‘coding’ them. For this data, codings were identified to summarize the location category in the diary template, and themes were identified in the free text diary entries (description of the event, comments).

### 3. RESULTS AND DISCUSSION

We now present and discuss the results of our analysis. We start by considering the time distribution and frequency of incidents, and their physical location. Then we study whether the participant liked in general what they heard and whether the incident lead to any follow-up action. Visual considerations and how participants hear (and hear about) music form the last two categories of analysis. Terms in the narrative text which correspond to classification labels are typeset in bold.



**Figure 1.** Time distribution of encounters with new music

#### 3.1. Time distribution and frequency of incidents

A striking aspect of the time distribution of encounters with new music is that they occur throughout the day (see Figure 1). Many participants live their lives immersed in music, and in opportunities to find new music:

*The range of times are from 8:15AM (just after I got up) through to 11:40PM. This tells me that I am liable to encounter new music at any time through out the day, except quite obviously when I am sleeping. [K]*

For some participants, opportunities for exposure to new music are linked to the availability of leisure time:

*I seem to find new music later in the day. This is probably because I typically only have time to listen to music for extended lengths of time after midday or so. [O]*

*...lack of new music encounters...there is very little time in my life that is available for listening to music. [L]*

For others, music is used frequently as a background when studying and during paid employment—extending the opportunity to encounter new music throughout most of their waking day.

The degree of exposure to music, and the variety of activities that lead to encounters with new music, came as a surprise to some participants (“...I never thought I was doing all these things and exposing myself to new music as often as I am” [I]).

### 3.2. Physical Location

Just as the participants could encounter music at most times of day (Figure 1), they also reported discovering new music in a variety of locations (Table 2). The vast majority of new music encounters occurred in private residences: in the participants’ own home, or while visiting the homes of friends and relatives.

The next most significant exposure occurred while participants were **en route** from one location to another: driving, taking a bus, or walking. When making short trips by car or bus, the radio is frequently used as a background, and may not be consciously attended to (“On an average day I would not register what was playing on the radio in the car. ... the radio is on as background noise.”; [L]). For longer trips the choice of music is more crucial, and generally one of the passengers will provide music for everyone in the car to listen to; it can be awkward if the passengers do not all share the same tastes. When walking, participants sometimes overhear new music (from passing cars, or other chance sources), and sometimes are surprised to encounter new music on their own mobile devices (“skipping randomly through tracks on my iPod, found something new”; [O]).

**Clubs** and **retail** environments bombard us with music as we drink, shop and dine, and the participants’ **workplaces** are primarily these types of commercial organizations as well. While at the **University**, students overhear music in the hallways, trade music on USB drives and CDs, listen in on each other’s mp3 player headphones, and play music in the labs late at night. Music complements **gym** activities, although those songs may not be appreciated in other contexts (“before didn’t really like the music ... maybe listening to them while doing exercise is a better combination” [N]).

| Location   | Description                                   | Count<br>(% of Total)   | Liked it?<br>(% of<br>Location) |
|------------|-----------------------------------------------|-------------------------|---------------------------------|
| Residence  | Residence of participants, friends, relatives | 241 (58.9%)             | 167 (69.3%)                     |
| En Route   | In car, bus, or while walking                 | 58 (14.2%)              | 30 (51.7%)                      |
| Retail     | Stores, restaurants                           | 39 (9.5%)               | 25 (64.1%)                      |
| University | Lecture halls, labs, hallways                 | 30 (7.3%)               | 18 (60%)                        |
| Workplace  | Employment outside university                 | 17 (4.2%)               | 8 (47.1%)                       |
| Club       | Nightclubs, bars, pubs                        | 8 (2%)                  | 4 (50%)                         |
| Gym        | Exercise music at gym                         | 4 (1%)                  | 3 (75%)                         |
| Unknown    | Location not identified                       | 4 (1%)                  | 3 (75%)                         |
| Other      | Hospital, band practice, etc.                 | 7 (1.7%)                | 5 (7.1%)                        |
| Total      |                                               | 409 incidents<br>(100%) | 255 Positive incidents          |

**Table 2.** Physical location when encountering new music

A total of 409 incidents were recorded, giving an average of 3.33 encounters per day per participant. This incident count is a lower bound on the number of new songs encountered—the duration of the incidents ranged from a few seconds (hearing a mobile phone ring) to six hours (listening to a classmate’s music during a late-night computer lab session). The range for incidents per participant ranged from three to 17 encounters in three days.

### 3.3. Was the music any good?

Each incident was coded as Positive (the participant liked at least one of the songs encountered), Negative (the participant disliked all the songs encountered), Indifferent (the participant neither liked nor disliked the songs; they were “so-so” [R] or “not too bad” [J]); or Unknown (the participant didn’t record any reaction to the song).

The majority of incidents—nearly two-thirds—resulted in the participants being introduced to one or more songs that they liked (and sometimes that they liked very much indeed; for example, “Classic, a masterpiece” [D] or “Love it! Want to hear more” [S]). Table 3 summarises the overall reactions to new music. This correlates with the findings of the informal BBC diary study of reactions to ‘non-chosen music’ (that is, music that the participants had not personally selected to play and correspond to our ‘passive’ labelled

incidents analyzed in Section 3.4). In the BBC study, 62% of diary entries were either positive (28%) or neutral (38%); most of the non-chosen music was not viewed negatively.

| Positive    | Negative    | Indifferent | Unknown   |
|-------------|-------------|-------------|-----------|
| 225 (62.3%) | 100 (11.1%) | 21 (5.1%)   | 33 (8.1%) |

**Table 3.** Reactions to new music

### 3.4. Active and Passive Diary Incidents

To gain further insight in to what our participants were doing when they encountered new music, we classified entries as either passive or active. The active category captures incidents when participants were specifically looking for new music: Web activity being the most common (this perhaps reflects the nature of the participants, who are IT students and universally web-savvy), but also including purposefully going into a music store to purchase a CD, for instance. The passive category correlated strongly (but not exclusively) with exposure to a broadcast medium such as radio or TV. Music encounters on broadcast media were not always passive, however; for example if a participant recorded that they specifically went looking for music to listen to on a music channel during an advert break, then this was tagged as active, as opposed to some flatmates having a music channel on in the background (passive). Sometimes an incident started out passive, but then transitioned to active: Participant [D] was watching a music channel and “The music video looked great, so I tried a few other songs, but they were just too noisy for me.” We recorded such events as active.

260 (63.6%) of incidents of new music encountered were passive, 146 (35.7%) active, and 3 could not be determined from the information recorded. We studied the data further to see if there was any correlation between active or passive incidents and any follow up action taken. While there was no significant difference in the desire for follow up action between the two categories—24.7% and 22.7% for active and passive cases respectively—a strong recurrent theme in the comments column for passive entries was that the participants felt that there was little they could do immediately to act on this desire. The participants’ location (in a car, at a friend’s house, in a shop) or the activity at the moment (talking to a friend, watching a movie) made it difficult to record details of the music for later searching, much less actually attempt to locate the music. This is a point we return to in Section 4, when we discuss implications for music information retrieval based software.

Several participants recognized that their overall strategy for new music acquisition was either passive (“...I found I do not actively search for new music. It more finds me” [J]) or active (“I heard and try to find new music when I was waiting and feel boring. So the result of feeling is to try to find something around to interest myself.” [AA]; “...encountering new music I like is clearly not a day-to-day activity that just happens.

I usually have to initialise the search for new music.” [FF]). There is a clear need to support both styles of interaction; this will be discussed further in Section 4.

### 3.5. Media: how people hear (about) music

As we go about our everyday lives we hear, and hear about, new music in an astonishing variety of ways (Table 4). Students seem to practically live on the Internet (again, the participants’ academic background in computing probably contributes to this), and the participants came across new music in practically every Web resource imaginable (in addition to music-related websites, MSN chat, MySpace, email, news feeds, etc). Other computer-related sources of diary entries include media players, music, video, and games.

| Media            | Count      | Media         | Count      |
|------------------|------------|---------------|------------|
| Internet         | 81 (21.8%) | Performance   | 17 (4.2%)  |
| Radio            | 77 (18.8%) | MP3 Player    | 16 (3.9%)  |
| TV               | 54 (13.2%) | Ringtone      | 6 (1.5%)   |
| CD               | 46 (11.2%) | Conversations | 5 (1.2%)   |
| Public broadcast | 27 (6.6%)  | Other         | 12 (2.9%)  |
| Computer         | 24 (5.9%)  | Unknown       | 26 (6.4%)  |
| Movie/DVD        | 18 (4.4%)  | Total         | 409 (100%) |

**Table 4.** Media with which new music is encountered

**Radio, TV, and Movie/DVD** encounters with music were, to a great extent, also under the control of the participants: they could, and often did, channel surf until they found music that was at least tolerable (“just flipping through the channels” [P]). In retail environments music is **broadcast** to the public—a prime example of the ‘intrusive music’ described in [2]—the hearer may find the music pleasant or neutral. A surprising number of diary entries (17) referred to live **performances**; these included professional musicians as well as amateurs (“Builders next door woke me up with their singing and butchering of an AC/DC song” [CC]). Participants shared music by exchanging or listening to music with **CDs** and their **mp3** players. **Ringtones** frequently include snatches of songs that are overheard when a nearby cellphone goes off, or sometimes listened to for fun (“laying out with mates and looking through ringtones. yea! Got them to 'bluetooth' the tones to me.” [J]). **Conversations** about music often led to recommendations of music or artists to try.

### 3.6. Visual Aspects of Music

The visual aspects of music can strongly influence the amount of attention paid to a new song, and the final like/dislike decision about the music. Sometimes the first encounter with the music is largely or even solely visual, rather than aural:

*first time saw hayley westenra new album...and got notice to that; like the cover when first saw it. What a beautiful girl [E]*

An attractive **music video** catches the eye and causes us to focus more on the music than we otherwise might:

*I turned on the tv and C4 was playing a show called 'blender' with a section called 'Try it...you might like it' Death Cab for Cutie were playing, who I have never heard before. I really liked it and I stared at the screen to make sure I didn't miss the name of the band... I will pursue them. [V]*

The best music videos complement the song (“Quite like it. The song and the video matched perfectly.” [HH]). The worst draw our attention to the aspects of the music, artist, and genre that we dislike (“Awful stuff. Beonce—no substance just boobs” [L]). Sometimes, though, the music is a disappointing accompaniment to interesting visuals (“the video was ok, but not really like the music at all.” [M]). Table 5 summarizes references to the visual aspects of music recorded in the diaries.

| Visual media                                                  | Diary entries | Liked it? |
|---------------------------------------------------------------|---------------|-----------|
| Music Video                                                   | 33            | 17        |
| Movie (in theatre, on TV, on DVD)                             | 12            | 10        |
| Other TV (commercials, show soundtracks, unspecified content) | 27            | 15        |
| Other DVD (content not specified)                             | 6             | 6         |

**Table 5.** Visual aspects of new music

Soundtracks to **movies**, **TV** shows, and **TV** commercials may be interesting, but it can be difficult to find out enough about the songs to be able to locate them later (TV: “I am out of the room when they show the name of the group so am unable to look them up.” [S]; Movie: “Good songs, but didn't know who they were by so will have to review credits.” [CC]). The difficulty of identifying, and recording, music metadata for later use is a recurring theme in the diaries.

#### 4. IMPLICATIONS FOR MIR SYSTEM DESIGN

Given these insights into how we encounter new music, we now turn our attention to how—in the context of user-centered design [5]—music information retrieval software can better support such patterns of behavior. Some comments reaffirm the rationale for existing software functionality and features; some suggest innovative ways that software (and related peripheral devices) can be shaped in the future.

From the diary entries we can see that active approaches to music encountering are fairly well supported by existing software and information systems, particularly internet-based approaches. Not so well-supported, however, are passive encounters with new music, particularly those that involve non-internet media, such as radio or television. The suggestions we make here deal primarily with more passive music encounters, and those that occur in situations where users can do nothing to follow up on an encounter immediately.

The participants encountered new music at a wide variety of locations, at all hours of the day and night. In the majority of diary incidents, the students were not

actively seeking new music; rather, new songs were encountered while engaged in other activities. New music might be encountered completely serendipitously (for example, another person’s mobile phone ringtone) or might be a windfall from another pursuit (for example, the soundtrack of a movie, or background music at a restaurant). This anytime/anywhere occurrence strongly suggests the use of a mobile platform to help capture ‘discovered’ music (or at the very least, to help capture the necessary metadata to follow up one’s music discoveries).

Nearly a quarter (23.4%) of the diary entries sparked a follow-on action of some sort. Media players and rich media sites (based around technologies such as Flash) that expose users to new music cater well for this pattern of use, for example, with “now playing” information and built in web browsing capabilities and links to related information.

Traditional radio and TV, however, fare less well with entries such as: “I like the R&B songs. Trying to memorise.” [Z], when listening to the radio and “Good songs, but didn't know who they were by so will have to review credits.” [CC], while watching a movie. These comments reflect frustration of potential music discoveries; sparks of interest have to be expressed as intentions rather than actions because the environments participants are in do not support doing anything else.

The two quotations above are representative of several such remarks relating to radio and TV. The data points to a significant gap in new music encounters between these media and on-line based experiences. Even shifting radio and TV to digital broadcast does not seem to improve the experience much, as—despite the much touted benefits of the integrated media experience—broadcasters to date do not seem to either have the inclination (or resources) to exploit the capabilities. Here we propose a way of bridging this divide between experience of new music and follow-up based on the technique of “laid back” searching [4]. Our suggestion has the additional benefit of unifying other forms of discovery, such as capturing social interactions when friends recommend music.

“Laid back” searching is a web searching method that caters for when users are not on-line, allowing them to record web queries at the moment they think of them on their (off-line) mobile devices. When a user’s mobile device re-establishes a network connection, the recorded queries are run and a bespoke interface allows users to browse the results. Recast to support users as they discover music, a “laid back” search approach is well suited to being out and about: in the car, retail outlet, or friend’s house—popular places in our study.

We propose an extension of this technique on a device with a microphone. The device would normally be on “standby”, and when a user hears new music (or any music of interest) that they want to follow up, a simple button press on their mobile device (phone, iPod, PDA) would record a snippet of the music. The device would also record the time of day and other metadata

(such as GPS co-ordinates, if available) to help present the recorded snippets when the device is docked.

Once the device is docked, the software would use audio fingerprinting [6] in connection with a server to assign metadata (song title, artist, etc.) to each sample. Additional audio-based music information retrieval techniques could also be used to determine (with manual override) whether the audio being sampled is music, or speech; this information could then be used to provide richer user interaction when the device is docked.

In a mode tailored for radio support, the device would record preemptively—say with a 10-minute buffer. This opens up the possibility of going back to the start of the song if the user signals interest in it. When the device is docked, MIR techniques would be used to find the beginning and end of the song and capture any speech at either end of the song (which may be the DJ naming the song or the artist); this information would in turn be presented to the user in a timeline. The software could also exploit information from stations broadcasting textual metadata using the RDS (Radio Data System). Using RDS metadata is notably simple for digital radio.

Personal recommendations made by friends would be captured with the device in ‘dictaphone’ mode, unless the friend could also play or sing the song, in which case radio mode-like interaction would be used.

Some instant messaging (IM) services allow users to publicize the music they are currently listening to; 1.5% of the diary entries in this study reflect new music encounters as a result of IM (“Internet surfing, saw friend’s MSN list showing the music he listening. Ask him sent it to me.” [R]). This type of music discovery could be promoted with a new play mode for an existing music player; in the new mode the player would monitor what a user’s ‘buddies’ are listening to and allow the user to hear excerpts of that music. Rather than using a peer-to-peer service (which raises copyright issues), we suggest excerpts be found heuristically using text based metadata and the user’s existing music sources. Heuristic matching does present the risk of the ‘wrong’ music being played, but this may also be a fun way for users to discover new music.

In light of this study, online radio-style recommender systems such as Pandora are well aligned with passive activities. Beyond searching for a seed song interaction is passive: the recommender system plays recommended songs and the user responds to them (yes/no/indifferent). More active behaviors (searching, browsing, exploring) are not well supported in this case—yet frequently the participants transition from passive to active behavior. This suggests a recommender system that also offered the search features offered by many media players would better meet user’s needs.

## 5. CONCLUSION

There is a tension in software design between the functionality provided and how it is, at times, put to use by a user-community. It is a symbiotic relationship: novel software applications, for instance, can guide

users to new possibilities and ways of interacting. Conversely, users can use (subvert!) software in unexpected ways—to achieve goals not envisaged by the original designers—which can ultimately feed back to further software innovation.

In this paper we have considered one such relationship within the context of music information retrieval: how people find and encounter new music. Using a diary study, we intentionally set the scope of the study to look beyond just computer-based encounters to gain a richer picture of how people find ‘new’ music. In relating our findings to music information retrieval software, we have reaffirmed the usefulness of existing software functionality, such as the low-effort aspect of the interface to recommender systems such as Pandora, and provided some insights for future design, such as the extension of ‘laid back’ searching to music retrieval, including a discussion of how music discovery might be supported by mobile devices.

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