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Making sense of music: meanings 10 to18 year olds attach to experimenter-selected musical materials

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Music's importance in young people's lives has long been acknowledged (North, Hargreaves & O'Neill, 2000; Thomson, Reece & Benedetto, 2014; Zillman & Gan, 1997). Research has provided insight into children and adolescents' music preferences and tastes (e.g. Getz, Chamorro-Premuzic & Roy, 2010; Hargreaves, North & Tarrant, 2016), uses of music, including self-regulation (Larson, 1995; Miranda & Claes, 2009; Saarikallio & Erkkilä, 2007), skill development (Deliège & Sloboda, 1996; Lamont, 2016; Schubert & McPherson, 2016), and subjective experiences of listening to and making music (Campbell, 2010; Finnäs, 2006; Gabrielsson, 2011; Herbert, 2012). However, very little research has specifically addressed children and adolescents' holistic understanding of music when listening. By 'holistic' we refer to meaning-making informed by musical attributes and extra-musical factors, a multimodal interaction between multisensory perception, cognitive and affective phenomena (Gabrielsson, 2011), elsewhere referred to as "hearing as" (Dibben, 2001, p. 183; Clarke, 2005; Zbikowski, 2002).

Existing research suggests young people in the industrialised West commonly engage in heteronomous listening modes, hearing music in terms of a range of socio-cultural sources.[1] Heteronomous listening may take the form of multimodal perception (visual and auditory blending, for example) (Gabrielsson, 2011, p. 379) or additionally incorporate cognitive phenomena such as memories and thoughts (Herbert, 2011, p. 187; Clarke, 2005, p. 135). Via gradual enculturation, involving repeated pairings of music with extra-musical stimuli, children accumulate subconsciously acquired perceived 'schematic' musical meanings

[1] Heteronomy, whereby music is experienced as 'reference', and is inseparable from personal, social and cultural factors (Clarke, 2005; Herbert, 2012; Meyer, 1956) contrasts with the notion of musical autonomy, wherein music possesses immanent, intramusical meaning via its structural properties (e.g. Levinson, 2009; Scruton, 1997; Lerdahl, 2003). These understandings are co-present within single listening episodes (Gabrielsson, 2011; Herbert, 2011).

(Schubert & McPherson, 2016, p. 224). The little previous research suggests they accumulate associations between musical styles and kinds of meaning prior to adolescence (Hallam and Rinta, 2014) and that heteronomous musical experience (particularly blending of visual and auditory modalities) is prevalent during childhood and early adolescence (Campbell, 2010; Herbert, 2012).

One question raised by this evidence is whether meanings arise from exposure to music in 'original' contexts (e.g. hearing plainsong sung within a sacred setting) or secondary contexts enabled by recorded media and mobile platforms (e.g. hearing plainsong within a non-religious videogame). Given the omnipresence of music in daily life (Rideout, Foehr & Roberts, 2010) and increased opportunities for musical contact on screens for 'digital natives' (Campbell, 2010, p. 219), one might anticipate that meaning-making draws on encounters with music in secondary contexts, particularly audiovisual media.

Music has been highlighted as a key 'developmental resource' from pre-pubescence to early adulthood (e.g. Miranda, 2013; Miranda, Blais-Rochette, Vaugon, Osman & Aria-Valenzuela, 2015), therefore we would expect to see psychosocial features manifest in music listening experiences. This includes heightened emotional reactivity between 10-and 16 years (Blakemore & Frith, 2005; Sawyer et. al, 2012; Spear, 2013; Casey, Jones & Hare, 2008, p. 8), reconstruction of self-concept and preoccupation with identity (e.g. Erikson, 1968; Havighurst, 1971) marked by impossible dreams and feelings of power mid-adolescence (Greydanus, 2012, p. 10-11), and a move away from present-centred ways of thinking and high hypnotic susceptibility with much involvement in fantasy (Rhue, 2004, p. 119), towards abstract (theoretical) thought processing (Greydanus, 2012, p. 10). Age, gender and training have been identified as factors mediating subjective experience. Age-related listening

correlations include decreasing ‘attentive-analytical’ listening up to age 17, incremental increases in ‘emotional listening’ during adolescence (Leipold & Loepthien, 2015 (age range 12 to 23 years)) and the emergence of defined listening styles at 13 years of age (Behne, 1997 (age range 11 to 20)), plus a dip in 'open-earedness' (receptivity to range of musical styles) c. age 10 or 11 (Hargreaves, North & Tarrant, 2016). Formal training has been shown to accelerate acquisition of certain listening skills, e.g. culture-specific knowledge, recognition of musical features, including structure (Corrigall & Schellenberg, 2016), in addition to enhancing attentional functioning (Hannon & Trainer, 2007). Girls are more likely than boys to adopt an ‘emotional’ listening mode (Leipold & Loepthien, 2015), use music for mood regulation (Herbert, 2012; North, Hargreaves & O'Neill, 2000 (age range 13-14); Miranda & Claes, 2009 (age range 15-19); Saarikallio, 2008 (age range 10-20)), and increases in mood regulation with music occur later in adolescence for boys (Saarikallio, 2008).

In sum, little evidence has accumulated regarding potential changes in holistic listening and meaning-making from prepubescence to early adolescence (Hallam & Rinta, 2014, p. 24), nor how this might be influenced by individual differences, including age, formal training and gender. We carried out a study to shed light on three main questions:[2]

1) How much do 10 to 18 year olds from different socio-demographic and musical backgrounds share acquired territory of cultural reference?

[2] This study is the third and final phase of a nationwide three year mixed-method empirical enquiry concerning the psychological characteristics of children and teenagers’ (age range 10-18) subjective experiences of listening to and making music in everyday, 'real-world' scenarios in the UK. Phase 1 utilized semi-structured interviews and free descriptions (completed by participants (N=34) over a 14 day period) to tap the phenomenology of young people's experiences of and with music (Herbert, 2012). Phase 2 examined associations between musical engagement (taken as a multifaceted phenomenon including musical production and reception) and age, gender, and personality characteristics via an online questionnaire (N=511).

2) How does unfamiliarity with original function/context or style of particular musics mediate meaning-making?

3) Are there developmental aspects to musical meaning-making during transitional periods from pre-pubescence to early, mid and late adolescence?

Method

Participants

Ninety young people aged between 10 and 18 were recruited. The aim was to access a population sample broadly representative of musical engagement and socio-demographic background across educational year groups 6-13 in the British school system, at the same time ensuring the dataset was of a size that could be analysed effectively. Three state secondary schools (all single sex), one state primary school and two private schools (including a coeducational cathedral school) took part and between them provided 15 students from year groups 6 (key stage 2), 7, 8, 9 (key stage 3) 10, 11 (key stage 4) and 12, 13 (key stage 5). 84 completed the online listening study (42 females and 42 males). Class music teachers gave a pre-scripted verbal summary of the study. All students who volunteered regularly listened to music, so this was a relevant and meaningful task for them. They differed widely in extent of musical involvement and training: the majority (90%, N = 75) played at least one instrument, of whom 47.6% (N = 40) identified as self-taught. A large proportion (85.7%, N = 72) had private instrumental lessons (on at least one instrument) and had taken instrumental examinations (77.3%, N = 65, ranging from ABRSM Grade 1 to Diploma level). Ethical approval was granted by the University of Oxford's Central University Research Ethics Committee.

Materials and equipment

The online listening study consisted of twenty short extracts of music (ranging from 6 to 31 seconds), a demographic questionnaire and section A of the Music USE questionnaire (Chin & Rickard, 2012), which taps three indices of musical engagement (frequency and duration of listening; playing; extent of training). Music extracts were selected to represent a wide variety of musical genres, cultures, musical characteristics, contexts of music-making (including examples participants might not ordinarily categorise as 'music', e.g. spontaneous chanting in a football stadium), and likely familiarity. Extracts ranged in duration according to their stimulus properties, (e.g. only a short extract was needed for an example of musical 'closure', comprising a cadential phrase from a string quartet; a longer extract was needed to present a cadenza). The Appendix contains full track listings. For easy reference, shorthand descriptors for extracts are employed (see Table 1).

< Table 1 here >

Free responses could be typed in separate text boxes for each extract.

Procedure

Most participants completed the study in class during school hours. Participants accessed it online, where they provided consent (for under 16s, primary carers's prior consent had been obtained) before listening to excerpts streamed to the site via a private SoundCloud account using headphones. Participants were instructed to "Write down the words, pictures, moods, feelings, stories or impressions that come into your head for each music example." They could move through excerpts at their own pace and repeat them if they wished. Completion time varied from 15 to 40 minutes (average c. 25).

Data analysis

Free reports were analysed qualitatively using thematic analysis (TA), as operationalized by Braun & Clarke (2006, 2013). We adopted an inductive, 'bottom up' approach centred on participant experience (i.e. realist/essentialist), reflecting the exploratory nature of the research questions. Thematic analysis included comparison of shared understandings of musical materials across participants, separately for two main types of response identified via analysis: affect (emotion or mood expressed or felt) and mental imagery (principally visual, but including other senses e.g. imagined tastes, smells, touch).[3] Intersubjective consistency was measured by calculating percentage of responses falling into one or other category, with an identification threshold of 75% (Diamond et al., 2013).

Hypotheses about relationships between themes and demographic variables (age, formal training, gender) were examined through quantitative analysis using manual, thematic coding and automated searches using linguistic inquiry software (Pennebaker, Booth, & Francis, 2007). This resulted in codings of free descriptions as dichotomous variables (presence/absence of themes) and word category frequency counts.

Results

Themes

Analysis of participant free responses yielded these candidate themes and (bracketed) sub-themes: Intersubjective consistency; Representation/induction of affect; Audiovisual media associations/fantasies indirectly or unrelated to original source context; Self in scenario; Generic otherness - orientalism; Filmic literacy (perception of narrative structure; visualisation); Relationship to music ('their music/my music'; function; music as virtual person; connoisseurship/criticism/mediating effect of training). These show intersubjective

[3] Where quotations are presented, ages of participants are reported to one decimal place to ensure anonymity but distinguish between individuals when they may be of the same age in whole years.

consistency (see Supplementary Materials 1). To conserve space, tables describing intersubjective consistency, and detailing regression analyses, are provided in Supplementary Materials 1 and 2 respectively.

Representation and induction of affect

The phrases 'it sounds like' and 'it makes me feel' recurred across extracts, suggesting differentiation of affect recognition and induction, e.g. ‘makes me feel alive and makes me want to dance around’ (F13, 4 chord pop).

Participants across age ranges appeared to experience a powerful response to 'atonal opening'. However, younger listeners’ reports indicated more immersion and induced emotion e.g. 'it makes me have a sad frown because it's a downer ... makes me feel empty ...fills my heart with sorrow' (F, 10.8); 'It makes me shrivel up and die inside' (F, 10.8); 'it sends a shiver down my spine' (F10.6); 'this piece of music made me feel alone and scared' (M11); 'will probably haunt me for a few more days now' (M11.3).

Distinctions between represented and induced emotion were less clear in older listeners’s reports; they tended to adopt bullet point descriptors e.g. 'provocative, uneasy, unnerving' (M, 17.3), 'air of mystery' (F, 16.8). Interestingly, although some participants responded to tracks 'atonal opening' and 'classic horror' as occupying a similar 'horrifying'/'scary' affective territory, a few (mainly) older listeners responded to the latter extract as too obvious to be scary, e.g. 'this music puts me on edge a bit but isn't enough to properly frighten me. I regard it more as a sound used in melodrama' (F, 18.4) indicating familiarity with filmic codes could desensitise to affect.

Observed differences in reported affect were explored further by coding for descriptors denoting induced affect (including both emotion and movement), and using binary logistic regression to check for associations with age, musical training and gender suggested by previous research (Robazza, Macaluso & D'urso, 1994; Greene, 1990; Boer et al, 2012; Leipold & Loepthien, 2015). Only age, musical training and their interaction were significant predictors of induced affect, which decreased as age and training each increased (Table i Supplementary Materials 2). The significant interaction between age and training suggests age-related decreases in induced affect are lessened by musical training.

Audiovisual media associations/fantasies indirectly- or unrelated to original source context

Participants frequently reported mental imagery indirectly related or unrelated to original musical source context. This typically occurred with Western classical and non-Western extracts, most frequently with a small cluster of musical sources and styles, included as probably unfamiliar to most participants ('Plainsong', 'Turkish, 'Partch'), exemplified in Table 2.

< Table 2 here >

Another group of audio-visual media associations comprised classic film music codes signifying drama or suspense imported into mainstream TV contexts. Older listeners frequently heard these as clichés/stylistic parodies e.g. the 'classic horror' extract, elicited such responses as 'I'm a celebrity get me out of here when there is a big drop or when they have to eat something disgusting' (M13.5); 'Sure the silhouette on the shower curtain comes to mind but the thought of parody films using this music can make me chuckle' (M16).

Self in scenario

Many participants visualised themselves in fantasy scenes or longer narratives. A factorial ANOVA on the number of first person singular pronouns in participant reports revealed significant differences according to Age, $F(2, 75) = 8.337$, $p < .01$: the youngest age group used more than either older group ($p < .01$), confirming the prevalence of self reference for those aged 10-12. A binary regression on counts of occurrence of 'self-in-scenario' descriptions, with Age, Musical Training and Gender as predictors revealed likelihood of reporting 'self-in-scenario' decreased with age and musical training, but that these factors interacted to decrease self-in-scenario reports less for those with higher levels of musical training (i.e. the decrease still occurred but to a lesser extent) (See Table ii Supplementary Materials 2)

Music afforded vicarious exploration of adult behaviours, contexts and fictional identities (often referencing an older, powerful or 'cool' self). The most common scenarios were performing or listening to music, being a protagonist in adventures or observer in historic settings, and romance (Table 3).

< Table 3 here >

Qualitative analysis suggested younger participants were more prone to describe fantasies as if happening in the present. A stepwise regression analysis of frequency of present tense usage confirmed this: use of present tense decreased with age but not with training (See Table iii Supplementary Materials 2). This effect seems to be associated with a school transition: an ANOVA with participants grouped into three spans (10-12, 13-15, and 16-18), and corrected for lack of homogeneity of variance by using square root transformation of scores, indicated a significant effect of age on use of present tense (Roy's Largest Root), $F(2, 75) = 4.115$, $p < .05$. Post hoc tests showed the youngest age group used present tense significantly

more often than either 13-15 year olds ($p < .01$) or 16-18 year olds ($p < .01$) and was unrelated to gender or musical training. This indicates that 10-12 year olds' written responses to the music were more present-focused.

Generic 'otherness' - orientalism

Respondents recognized that 'J-Pop', 'Latin House' and 'Turkish' exhibited non-Western musical referents, but the majority referenced geographical location rather than accurate cultural source (J-pop = 21; Latin House = 4; Turkish = 3). Suggested locations for 'Turkish' were diverse (31 = India, Egypt =12, Middle East = 7, Arabic = 5, Spanish = 5, Mauritius =1, Mexico = 1). Associative, as opposed to affective or analytical responses were dominant, the largest group showing clear influences from film, TV, computer games, holidays and (to a lesser extent) restaurant meals (Table 4).

<Table 4 here >

The clearest influence from film emerged in responses to 'Turkish', which was also the extract most associated with generic 'otherness' (i.e. musical orientalism, understood as Western depiction or imitation of aspects of Eastern cultures). Film was sometimes directly referenced; more often descriptions displayed non-specific filmic quality. India emerged as most common reference, followed by Egypt e.g. 'Indian elephants dancing, all decorated' (F, 11.2); 'people doing an Egyptian dance in front of pyramids in Egypt' (F, 11.4). Seven responses referencing India centred on Bollywood e.g. 'Bollywood dancing, all the sparkles and sari clothes, the women with henna and jewellery, lots of complex dance routines and hand movements, homemade instruments' (F, 17.8). A substantial number of responses concerned generic 'foreignness' comprising culturally mixed sources e.g. 'Reminds me of Pakistan and my granddad. Saris and piminda and my mum and curries and hypnotising. Snakes and Indiana Jones in the desert' (F, 14.9).

Filmic literacy

Multimedia (computer games, TV and above all, film) were constant points of reference; filmic listening appeared to be a default sense-making mode. Predictably, filmic associations were most prevalent for extracts displaying narrativity (film and classical musics). Filmic descriptions fell into two groups; one concerned with perception of narrative structure, the other with visualisation.

Perception of narrative structure. References reflected Tagg and Clarida's (2003) distinction between episodic, micro-structural events 'typified by such responses as HAS JUST, AFTER THAT, ABOUT TO HAPPEN', acting as anacruses pushing the musical narrative forward (2003, p. 102) and a macro-structural sense of synoptic time - a 'bird's eye view of the imagined film, episode or series as a whole (e.g. START OF FILM ... ENDING' (2003, p. 130)' (Table 5).

< Table 5 here >

Visualisation. Visualisations attached to the majority of extracts, showing awareness of camera techniques (e.g. slow motion shots/panning/zoom), sometimes described explicitly (Table 6). A small number of reports referred to filmic techniques used in video games, such as 'cut-scene' - a non-interactive interruption to game play.

< Table 6 here >

Relationship to music

Many responses to classical, popular and 40s jazz extracts referenced perceived relationship to particular extracts. The majority concerned degree of perceived ownership.

Ownership: 'Their music/my music.' Classical music was frequently associated with school, e.g. 'music concert, school, playing the flute' (F, 15.4), or older people, hence regarded with detachment as 'their' music, e.g. 'It sounds like a teacher who is trying to show her class the

beauty of music' (M, 10.8). Some classically trained participants seemed to associate classical music with playing of rather than listening to music, even those with high skill levels, as in these responses to 'violin concerto': 'would be enjoyable to play, not listen to' (diploma level F, 16.8); 'Lark Ascending vibe. School concert. Time to leave' (grade 8 M, 18.1). The 'their music/my music' distinction clearly recurred in responses to '40s jazz', both in terms of age distinction ('It makes me think of what my mum and dad would have listened to' (F10.6)), and preference ('I can sort of see the appeal coming from a family of jazz anoraks but to me this music just doesn't excite me' (F, 16.8)). However, some younger participants identified with this extract, partly because of an association with cartoon music ('makes me feel like I'm in my favourite children's TV show, Tom and Jerry!' (F,11.2)), but also because of family listening background ('I might like this kind of tune more than other people my age because I have grown up listening to older stuff like Al Green, Stevie Wonder, The Beatles etc.' (M11.8)), or nostalgia ('I like this because I like the old kinda feel to it. I'm only 12 but I like the old sort of songs' (F13)). Both these examples demonstrate awareness of expected peer group music preferences.

Ownership: Function. Another group of responses claimed ownership of particular extracts by linking them to personal everyday functions (mostly popular music examples). The following relate to '4 chord pop': 'the kind of thing that I would listen to when I ride up the skate park' (M, 13.5); 'something I would listen to on my way to school' (M, 14); 'at a concert, in your bedroom listening to music with friends, in the car stuck in a traffic jam, at your frees in lunchtime, when you're exercising' (F,17.8); ...Music for when I'm in my bedroom alone and need to relax. Kind of music that would help deal with stuff' (F, 14.9).

***Music as virtual person*.** Occasionally, participants appeared to hear music (mainly classical extracts) as projecting 'person-like' characteristics (Watt & Ash, 1998, p. 49). Responses suggested that participants across ages felt a sense of being confronted by ‘atonal opening’, apparent in frequency of powerfully direct affective responses (see 'representation and induction of emotion' above). A creature-like quality is common to these two accounts:

> 'I am sitting still for this extract- I feel that it wants me to listen. The music symbolises a nasty shock which has hurt someone very much' It sounds like an innocent being has been hurt by something or someone dreadful' (F 14.6)

> 'this makes me feel very uncomfortable, like someone is watching me, or hiding under my bed or in my cupboard waiting for me to fall asleep, someone with big ever-watching eyes' (F, 18.4).

Connoisseurship/criticism/mediating effect of training. Self-reports from participants at specialist music schools and/or possessing post grade 8 diplomas indicated mediating effects of high levels of training e.g.: 'boys singing, plainsong, cathedral, silent congregation in a service' (response to 'Plainsong', M, 13.1, cathedral scholar);
'I have bad connotations with this as it has been played by many boys I know who I find irritating and seem to play to compete. This tune is always one that they call out on buskers nights and therefore feels second-rate and overused though I can admire the flawless playing in this version' (response to '40s jazz F14.6, junior conservatoire jazz student).

At times, specialist music experience triggered a connoisseur-like listening stance, as in two responses from a participant (F, 16.8, diploma level) music programmer: 'The programming

is absolutely gorgeous and I enjoy it instantly for that' (response to 'Latin House'); 'The amount to which the vocals have been processed is ... incredibly distracting' (response to '4 chord pop'). Older participants tended to be the source of negatively critical responses (rather than bald statements of liking/disliking), and showed awareness of clichés, regardless of formal training, evidencing longer exposure to particular musics e.g. 'everyday music for the teen generation, motivation/loud music, simple static chords and simple words, not musically challenging to listen to' (F, 17.8, response to '4-chord pop'); 'features one of my least favourite chord progressions known to man' (F, 16.8, response to '4-chord pop'); 'cheesy key change' (M, 18.1, response to 'ancient battle').

Mediating effects of classroom music lessons manifested as analytical focus on musical characteristics, with apparent increase from 15 years of age. A binary logistic regression revealed that Musical Training, but not Age, significantly predicted occurrence of analytical descriptions (Table iv Supplementary Materials 2). Such responses typically ignored affective aspects of music and adopted learned technical terms e.g.: 'Starts homophonic however slowly the violin melody is developed making it melody and accompaniment ...Classical - proportional - antecedent and consequent' (F, 17.1, response to 'violin concerto'); 'Kick drum at the beginning then it cuts out. Repeated vocals, in a loop-synth chords, minor-Syncopated rhythm in another percussion instrument. Part of a bigger dance track. Sounds like a section just before the drop' (F17.7, response to 'Latin House'). A few reports (typically from participants with higher levels of instrumental training) integrated music terminology with extra-musical imagery, as in this account from a post-diploma level student:

> 'The pure voices remind me of cathedrals and their wonderful, spiritual atmosphere. I just want to stay still and admire their beauty. Due to their singing in unison, I can

almost see their innocent faces on grass on some spring's morning. The Dorian mode that they're using is typical of monasteries ... ' (F, 14.6, response to 'plainsong').

Discussion

Written free responses from our sample of British young people were characterised by significant shared levels of cultural understanding, despite differences in socio-demographic background and musical training (Research question 1). Participant responses demonstrated intersubjective consensus regarding affect (across 75% of extracts) and mental imagery (across 90% of extracts), even though materials were not self-chosen. This accords with findings from studies of adults' musical meaning (e.g. Dibben, 2001; Kristen & Shevy, 2012; Tagg & Clarida, 2003).

Intersubjective consensus was apparent within school year groups and across ages, suggesting that enculturation is advanced by the onset of adolescence. This confirms Schubert and McPherson's hypothesis that rapid accumulation of associations, involving the pairing of music with extra-musical stimuli, occurs between the ages of c. 3 and 7, followed by a period (until adolescence) marked by 'subconscious abstraction of musical and extra musical rules' (2016, p. 223). As expected from previous studies of adult and child listeners, heteronomous modes of listening dominated, marked by frequent allusions to audiovisual media and production techniques.

Meaning-making did not always relate to the original musical source context, particularly if musical styles were unfamiliar (Research question 2). The ubiquity of recorded music, accentuated by the proliferation of digital music services and mobile listening technologies,

means young people may encounter a range of musical styles in settings other than original contexts/functions. Interactions between music and new settings afford fresh extra-musical meanings not, however, unconnected with intramusical characteristics. For example, the plainsong extract's capacity to specify solemnity and sense of ritual remained, even when associated with computer game scenarios. Interestingly, reports recontextualising extracts with non-Western characteristics demonstrated less nuanced perceptual relationships to musical attributes. A generic exotic 'otherness' predominated, informed mainly by film and TV.

Both age and training mediated musical meaning-making, affirming influences of developmental factors on holistic musical understanding (Research question 3). Differences in listening style characteristics mapped approximately onto age groups. Ten to 12 year olds' reports showed much self-reference, implying induced affect and physical responses (moving or wanting to move to music). Self-in-scenario visualisations (frequently centring on an older, powerful self) were particularly common for this age group, characterised by high levels of fantasy, and present-tense descriptions of visualisations, aspects of cognitive processing expected for this age group (Greydanus, 2012; Rhue, 2004). Studies of written language development indicate cognitive and affective processing is reflected in written language, confirming change from use of first person pronouns and affective response to use of third person pronouns, abstract concepts and technical vocabulary from c. age 13 (Christie & Derewianka, 2008). This supports the inference that listening or reporting modes in relation to music characterised by immediate, frequently multimodal connection with music may be common between prepubescence and early adolescence. Findings from the first phase of the current enquiry also referenced such modes (Herbert, 2012). Evolved styles of listening may

thus be more apparent pre-13 years of age than findings from Behne's (1997) study of 11-17 year olds music listening practices indicate, a phenomenon that merits further study.

Self reference was less evident in reports from 13 to 15 year olds and almost entirely absent for the 16+ age group. As age and musical training levels increased, reports of induced affect also decreased. Emotion recognition was correspondingly more nuanced in reports from 16 to 18 year olds, suggesting that maturation of emotion perception continues across adolescence (Schubert & McPherson, 2016; Watson, 1942). Training appeared to delay decreases of self-in-scenario visualisations and induced affect. Training may sensitise individuals to musical attributes. There is also some evidence for correlation between high levels of musical training and imaginative involvement/fantasy proneness (Hilgard, 1970; Kemp, 1996), supporting association between musical training and increased imaginative self-involvement.

Significant increase in analytical focus on musical characteristics was apparent in participants aged c.15 plus, possibly reflecting influence of GCSE and A level music tuition and context-effects of responding to music in school. But increases in analytical listening appeared to be training-, rather than age-related (Hannon & Trainer, 2007). Whilst this contrasts with Leipold and Loepthien's (2015) identification of age-related increases in 'attentive-analytical' listening after age 17, differences in study design make comparison difficult.

Self-reports from teenagers with particularly high levels of training suggested analytical meaning-making was not solely concentrated on cognitive appraisal of musical characteristics, but mediated by training and musical exposure. In other words, musical identity mediated meaning-making (Hargreaves, MacDonald & Miell, 2012). Junior conservatoire instrumentalists mentioned aspects of performance style and technique,

whereas music technology specialists highlighted aspects of music programming. Fluctuation between different listening styles (analytical, emotional, associative) within single listening episodes was common.

Regardless of training, results confirmed a shift in music listening from non-reflective immersion in early adolescence to objective, critical stances from mid-adolescence, with connoisseur-like evaluation of style and musical characteristics apparent in self-reports from 16 to 18 year olds. This supports the move towards metacognitive processing later in adolescence outlined in models of musical development (e.g. Hargreaves & Galton, 1992). Meaning-making for 16+ adolescents was informed more than for any other age group by awareness of musical and extra-musical clichés (four chord pop progressions, musical codes specifying suspense etc.), evidence of substantial exposure to particular musics. This supports Schubert and McPherson's hypothesis (2016, p. 236) that musical and extra musical culturally specific 'rules' acquired in late childhood via enculturation, are increasingly devalued in adolescence as meaning-making becomes increasingly subjective.

Our study was not designed to assess openness to different musical styles, but, as with most empirical studies of open-earedness, *did* employ experimenter-selected music. Self-reports from the 10 to 12 year olds did not show less openness, instead demonstrating uncritical engagement across many examples. However, age 'as a simple biological variable' constitutes only one factor informing musical preferences (Kopiez & Lehmann, 2008, p. 134-5). Other significant influences include qualities of music (e.g. complexity), musical interaction (e.g. level of familiarity) and listening context, perceived relevance of function to listeners (e.g. being able to dance/move to music) plus personality traits and media exposure (Hargreaves et al., 2016; Kopiez & Lehmann, 2008).

We found no evidence for association between gender and ways of listening/meanings attached to music, apart from a cluster of references to romantic relationships in girls' reports. This is surprising, given extant research findings supporting gender differences in musical responses. However, it could be such associations are more likely to emerge in self-report studies of self-chosen music in naturalistic contexts of use (rather than 'materials'), as was the case in the purely qualitative (interview and diary) phases of the enquiry (Herbert, 2012) in which girls adopted music for emotional self-regulation to a greater extent than boys.

In conclusion, this study provided evidence that meanings children and teenagers attach to music arise from holistic synthesis of intra- and extra-musical characteristics and that meaning-making alters across adolescence. Although our study highlighted ways age and training mediated styles of listening, musical understanding is determined by systemic interaction of such individual differences with a broad range of phenomena, including neuropsychophysiological maturation, enculturation and identity formation.

Limitations and future directions

Insights offered here are based on British participants and a specific music selection, therefore caution should be exercised in generalising these results. Ecological validity was necessarily compromised to compare perceptions of children and teenagers from different musical and socio-demographic backgrounds to the same music. Context effects of situation (classroom setting) and expectation (tailoring responses to perceived teacher requirements) may have triggered behaviours e.g. analytical engagement (in the case of secondary school students), or writing about music in a visual way (in the case of primary school children). Decline of self-in-scenario descriptions with age might be partly explained by use of

experimenter-selected materials, plus increased social awareness with growing reluctance to share personal fantasies in classroom contexts. Additionally, the sole use of written reports to capture understandings of meaning could have excluded non-verbal facets of subjective experience, also introducing the possibility that contents of self-reports would reflect gender differences in written skills e.g. girls might find writing easier and be more likely to reference emotions than boys (Fearrington, Parker, Kidder-Ashley & Gagnon, 2014; Halpern, 2012). However, gender differences in written skills were not apparent across reports from this sample.

A final limitation is the focus on listening at one timepoint. Future longitudinal listening studies could facilitate mapping of individual's musical interaction in terms of meaning-making, preferences and emergent taste patterns across adolescence. The ways individual differences mediate young people's musical understanding also merit further research, particularly the role of personality (e.g. Hargreaves et al., 2012).

Young people's music listening practices during the transition between adolescence and adulthood have been well documented in literature relating to music taste, preferences and everyday uses of music. Our study is one of the first to focus simultaneously on the intra- and extra-musical meanings young people attach to music when listening i.e. music heard holistically as 'material'. Attending to meanings young people attribute to musical ‘materials’ brings into focus the ways intersubjective consistency arises from common cultural reference, notably audiovisual media literacy, alongside developmental and psychosocial changes.

Ethical approval

Ethical approval for this project was given by the University of Oxford's Central University Research Ethics Committee [ref number: SSD/CUREC1A/12-214].

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Appendix 1. Sound examples.

1. J-Pop (Terra "Flowers", (0:17-0:39), *Dance Dance Revolution SuperNova 2).*
2. Contemporary jazz (Phil Meadows Group "Fin" (0.00-0.08), *Engines Of Creation).*
3. 'Romantic/luscious' '40s film theme (Theme from "Way To The Stars" (0.00-0.30), *Legend Of The Glass Mountain/Adventure).*
4. Atonal opening, slow (*Webern, Five Movements for String Quartet*, op.5, no.2, b.1-2. *Webern, Complete Works, 1991*).
5. Folk (John Whelan "Riverboat Set: Denis Dillon's* / Square Dance Polka* / Dancing on the Riverboat" (c.0.30 - c.0.46), *Passage of Time*).
6. Film - classic suspense (Ray Heindorf "Street Car" (0.00-0.15), *4 Great Film Scores*).
7. 40s jazz (Dizzy Gillespie "Night In Tunisia" (c. 1.07-1.18), *Night In Tunisia).*
8. Plainsong 'old' (Choralschola des Instituts für Kirchenmusic und Orgel "Alleluia" (Pulchra es amica mea (Hild 6.3) (0.00-0.11), *Stark Wie Der Tod Ist Die Liebe).*
9. Latin House (Todd Terry, House of Gypsies. Matteo DiMarr's Old School Meets New School Remix "Samba" (c.3.45-3.56), *Pump It Up Latin House).*
10. Film - classic horror (Bernard Hermann "Psycho - Shower Scene Theme" (0.15-0.32). Retrieved from *http://www.youtube.com/watch?v=Me-VhC9ieh0*
11. Traditional hymn (The choir of the Abbey School, Tewkesbury - Hubert Parry "Dear Lord And Father Of Mankind (Repton)" (0.00-0.21), *Favourite Hymns For All Seasons, Vol. 2*)
12. Football chant - ('Soccer Crowd (150 people) Sing/Chant'. Retrieved from *http://www.freesfx.co.uk*)
13. Turkish Saz (Okan Murat Öztürk "Memberi" (0.00-0.13), *Turkish Authentic Saz).*
14. Mediaeval Secular (Dufay Collective "Lamento di Tristano - La Rotta" (4.40- 4.52) , *A L 'Estampida - Medieval Dance Music*).
15. Film - 'ancient' battle (Michael Taylor "Ancient Battle Trailer" (0.55- c.1.19). *Smartass Music.com* (Royalty Free Music).
16. Four chord pop song (Kelly Clarkson "Behind These Hazel Eyes" (0.00-0.11), *Breakaway).*

17. Partch (Harry Partch (Gate 5 ensemble & Horace Schwartz. "Castor & Pollux. A Dance For The Twin Rhythms of Gemini II" (7.13-c.7.31), *The Harry Partch Collection, Vol. 1).*
18. Perfect cadence, ending (Haydn *String Quartet op.76*, no.2, mvt 1, b.152/2-154. *Haydn String Quartets, op.76, no.s 1-3, 1989*).
19. Remix (The Avalanches "Frontier Psychiatrist" (0.48-1.13). *Since I Left You?*
20. Violin theme (Beethoven, *Violin Concerto in D major*, op.61, mvt 1, b.137-38). *Eclecti Classical Improvisations*.

Tables

Table 1. Music extracts

Extract	Shorthand Descriptor	Extract Length
1	J-Pop	22s
2	Contemporary Jazz	6s
3	Romantic '40s film	30s
4	Atonal opening	18s
5	Irish Folk	16s
6	Classic suspense film	15s
7	'40s jazz	13s
8	Plainsong	11s
9	Latin House	11s
10	Classic horror film	17s
11	Football chant	10s
12	19th century hymn	21s
13	Turkish	13s
14	Mediaeval secular	12s
15	'Ancient' battle film	24s
16	4 chord pop	11s
17	Partch	28s
18	Perfect cadence	7s
19	Remix	25s
20	Violin concerto	22s

Table 2 Audiovisual media associations to the extract 'Plainsong'.

Audiovisual reference	Response
Film	'all these evil people worshipping an evil person standing in circle round the people wearing a black gown with a hood covering their heads and there are torches lit' (M, 10.77; 'in a movie when someone has been shot and the time slows down they would play [this]' (M, 11)
Computer game	'It reminds me of one particular game, *Halo*, where it has the exact same feeling and sound to it at the very beginning when there are some guys floating in space'.(M, 11.8).

Table 3. Scenarios described by 10-12 year olds

Scenario: Performing or listening to music	
Extract	**Response**
40s Jazz	'I'm in New Orleans belting out a tune watching the early sun sink in to the night - nothing can stop me' (F11.1). 'I am singing in a club at the time of Marilyn Monroe.' (M10.98)
4 Chord Pop	'I am gonna riff out on my guitar loving life with my 'besties' ... practising with my band in the garage' (F, 11.1); ' It takes me into a huge studio where I am listening to a famous band recording and they are blazing their heads off' (M, 11.3).
Scenario: Protagonist on adventure	
Extract	**Response**
Ancient Battle	'I am riding on a horse into the mist of battle and the rest of the cavalry is charging along by my side. I see my comrades hit by a hail of silver arrows, the thuds of their bodies striking the floor creates an ominous drum roll... I feel tense...(M, 11.5)
Classic Suspense	'I'm on a spy show and I'm the evil villain lurking in the shadows thinking of new evil schemes (F, 11.1); 'This made me feel like a secret agent on a mission' (M, 11)
Classic Horror	'it feels like someone is about to attack me. There is a murderer in the city attacking everyone and he very sly and mysterious (M10.3)
Scenario: Observer in historic setting	
Atonal Opening	I am in Victorian London and there are strange looking people loitering on the street. I feel a cold chill running down my back and a sense of curiosity' (F, 11)
Violin Concerto	'I am in a Victorian theatre. It is quite old and sophisticated and I imagine hundreds of rich Victorians gazing down at the stage. I am in a sort of trance. The people are all dressed in waistcoats and long suits. They are wearing hats and carry canes'. (M, 11.5)
Scenario: Romance	
Extract	**Response**
Romantic 40s Film	'I feel free and calm. I am at a ball and a kind man is dancing with me and looking at me with deep emotions of love and happiness' (F, 11); 'running in slow motion towards someone I love, that I thought I may never see again, someone that I hold deep in my heart' (female, 11.1)

Table 4. Extra-musical sources: generic 'otherness' - orientalism

Source reference: Film	
Extract	**Response**
Turkish	'like those movies when the main character has gone to Egypt to retrieve a treasure from the pyramids (M, 10.8); 'A movie where an Indian princess is on a camel (F, 10.6)
Source reference: Filmic scenario	
Extract	**Response**
Turkish	'Heat, red and yellow, people playing together in the street, camera pan to people dancing' (F, 16.7)
Source reference: Computer game	
Extract	**Response**
Turkish	'Super Mario Galaxy II, Egypt, desert, belly dancing' (M, 13.1)
Source reference: TV travel programme	
Extract	**Response**
Turkish	'Egypt, belly dancing, panning across a desert, montage of an Egyptian holiday preview' (M, 14)
J-Pop	'Holiday programme. Jubilant New Years day in China. Dragons loop between colossal crowds' (M, 12)
Source reference: Holidays	
Extract	**Response**
Latin House	'Holiday, hot country, dancing-party-friends-food' (F, 15.6)
Turkish	'I see the Mountains of 'Pergamon' in Turkey and the nomads delivering their food to market. I feel a sense of appreciation for the technique of the saz player' (F, 14.6)
Source reference: Restaurants	
Extract	**Response**
Turkish	'curry - the *Raj Dani* in West Kingsdown - Elvis in the restaurant' (M, 13.5)

Table 5. Filmic influence on listening: narrative structure

Narrative structure: episodic references	
Extract	**Response**
Romantic 40s film	'something dramatic's about to happen' (M, 13.3); 'the bad guy is about to appear for the first time' (M, 11.8); 'opening credits (F, 16.6)
Atonal opening	'sounds like something tragic will happen soon'(F14.5); 'something bad is about to happen' (F13)
Classic suspense	'Something bad is going to happen' (M, 14.6, M, 12.5, M, 11.8)
Ancient battle	'getting ready for something to happen' (F, 14.1)
Narrative structure: synoptic references	
Extract	**Response**
Romantic 40s film	'opening to an old film' (F, 18.4); 'building a big bang but the bang never happens' (M.12.9); 'telling a story, build up, going through something' (F 14.1)
Atonal opening	'sounded like it was telling a story' (F12.4)
Ancient battle	'The climax of the movie or the end of it when the goodies have won' (F, 11.5)

Table 6. Filmic influence on listening: camera techniques

Film technique: zoom	
Extract	**Response**
Romantic 40s film	'See a running [set] of pictures of a field of long grass and flowers and then zooming in onto a house near the end' (Female, 16.6)
Film technique: panning	
Extract	**Response**
Ancient Battle	fighting scene, end of a film, someone walking to a cliff edge after a long walk and then panning over a large waterfall or something dramatic (M, 14)
Film technique: slow motion	
Extract	**Response**
Plainsong	'In a movie when someone has been shot and the time slows down they would play [this] (M, 11)
Classic horror	'everything seems to slow down. The last bit is a bit like *Jaws*' (M11.8)
Film technique: dramatic tableau	
Extract	**Response**
Atonal opening	'...the image partway through a film, where everything is going wrong in the characters life and he is standing by a street with the moon obscured by clouds. It's raining heavily and cars are whizzing by with bright headlights, ignoring him and splashing him with even more rain as he stands sodden and miserable' (M, 11.8)
40s Jazz	'A sanded down table sitting alone with just an empty bottle' (M,12)
Film technique: cut-scene	
Extract	**Response**
Classic suspense	'Elevator. Still. Cut-scene' (M, 14)

Supplementary material 1 (Intersubjective Consistency)

Intersubjective consensus and dissent: mental imagery. Thematic analysis of mental imagery responses to eighteen extracts demonstrated good levels of intersubjective consistency, suggesting significant shared territory of cultural reference across the sample. Table A exemplifies similarities in mental imagery evoked for different listeners by the same music extract, as well as similarities between the reference territory evoked by different extracts. Table B presents representative examples of intersubjective dissent. Descriptions referenced personal and cultural sources, ranging from complete mini fantasy-narratives (e.g. imagining oneself as a successful protagonist during the 'ancient battle film' extract), termed 'imaginative fantasies' (IF in Table C) (Herbert, 2012, p. 428), to successive 'snapshot' associations (A in Table C) (e.g. associating a TV travel programme with the 'Turkish' extract). Mental imagery responses to 'Romantic 40s film', 'atonal opening', 'classic suspense film', '40s jazz', 'plainsong', 'classic horror film', 'Turkish', 'ancient battle film', 'violin concerto' tended to describe imaginative fantasies, as opposed to brief associative references.

< Tables A, B and C here >

Intersubjective consensus and dissent: affect. Affect descriptors to fifteen extracts demonstrated a good level of intersubjective consistency, suggesting significant shared emotional understanding (Table C). Extracts attracting highest numbers of (concordant) emotion terms possessed an extensional/narrative structure and affective contrasts, suggesting that musical materials differed in the extent to which they afforded a range of experiences.

Table A Intersubjective consent: similar mental imagery described by listeners in response to two extracts (Violin Concerto (v) and Romantic 40s Film (r))**.**

No.	**Extract title**	**Extra-musical theme**	**Representative descriptive exemplars**
20 3	Violin Concerto (v) Romantic 40s film (r)	A generic, affluent past.	'Ending to 1930s classic love film, I see the stately home and the guys in their suits and pipes briefly'. (F, 14.6 r); 'classical music playing in a period drama, at a summer picnic, lots of posh people in big dresses swanning around fanning themselves, in front of a big white house. 1800s' (F, 16.7 v)
		Royalty/fairytale	'... makes me feel like I am in a foxtrot. The first thing that comes into my head is the Royal King and Queen dancing in a exquisite ballroom' (M, 11.4 r); 'perfect fairytale wedding in a castle far, far away' (F, 16.2 v).
		Nature/outdoors	'A new start after a horrible war of some sort. I visualise English countryside and farms ... makes me feel tranquil and more clear in my mind' (F, 14.6 v); 'Tranquillity in a field. A bed of grass moulded to the shape of this person who gazes at the clouds, not a care in the world' (M, 12. v)
		Older people	'My grandparents and old people' (F, 13. v); 'piece for elderly person's birthday' - (M, 11. v)

Table B Intersubjective dissent: dissimilar mental imagery evoked by Partch extract**.**

No.	Extract title	Extra-musical theme	Representative descriptive exemplars
17	Partch	Kitchen/cans	'Passionate pots and pans' (M10.6); 'lots of cooking pots and pans flying around' (M, 15.2
		Street market/festival	Caribbean drums at a festival' (M15.2); 'in a market place in India or Bangkok' (F17.8); 'Chinese New Year - Can smell all the spices and foods being prepared ... (F16.6)
		Disparate references	'all the toy's in a toy shop are coming to life' (M11); **'**music lessons in primary school' (F15.38); 'monotonous mechanical repetitive factory' (M17.3); 'mixed up sounds, lots of babies with instruments' (M14).

Table C Intersubjective consistency on the affective character of the music (affect descriptors) and kinds of associations (mental imagery).

Extract	**Shorthand Descriptor**	**Mental imagery: imaginative fantasy (IF) versus associative reference (A)**	**Affect descriptors: intersubjective consensus (C) and dissent (D)**
1	J-Pop	A	C
2	Contemporary Jazz	A	D
3	Romantic '40s film	IF	C
4	Atonal opening	IF	C
5	Irish Folk	A	C
6	Classic suspense film	IF	C
7	'40s jazz	IF	C
8	Plainsong	IF	D
9	Latin House	A	C
10	Classic horror film	IF	C
11	Football chant	A	C
12	19th century hymn	A	C
13	Turkish	IF	D
14	Mediaeval secular	A	C
15	'Ancient' battle film	IF	C
16	4 chord pop	A	C
17	Partch	A	D
18	Perfect cadence	A	C
19	Remix	A	D
20	Violin concerto	IF	C

Supplementary material 2 (Regression Tables)

Table i: Binary logistic regression of reports of induced affect in participants' free descriptions summed across extracts.

		95% Confidence Interval for Odds Ratio		
	B (SE)	Lower	Odds Ratio	Upper
Intercept	11.01(1.53)***			
Age	-1.05(0.14)***	0.27	0.35	0.46
IMT	-0.85(0.14)***	0.33	0.43	0.57
Gender	0.28(0.15)	0.98	1.32	1.78
Age x IMT	0.07(0.01)***	1.05	1.07	1.1

Note: Model $\chi^2(4) = 155.44$, $p = <.001$. *** $p < .001$.

Table ii: Binary logistic regression of reports of self-in-scenario.

		95% Confidence Interval for Odds Ratio		
	B (SE)	Lower	Odds Ratio	Upper
Intercept	18.48(2.12)***			
Age	-1.77(0.19)***	0.12	0.17	0.25
IMT	-1.56(0.17)***	0.15	0.21	0.29
Gender	0.31(0.19)	0.93	1.36	2
Age x IMT	0.13(0.01)***	1.11	1.14	1.17

Note: $\chi^2(4) = 148.16$, $p = <.001$. *** $p < .001$.

Table iii: Multiple regression of frequency of present tense in participants' free descriptions summed across extracts.

	B	*SE B*	β
Model			
Constant	18.86	2.85	
Age	-.88	.20	-.44***

Note: $R^2 = .19$ ($p < .001$). *** $p < .001$

Table iv: Binary logistic regression of the occurrence of analytical descriptions.

		95% Confidence Interval for Odds Ratio		
	B (SE)	Lower	Odds Ratio	Upper
Intercept	-1.59(1.08)			
Age	-0.05(0.09)	0.80	0.95	1.13
IMT	0.22(0.11)*	1.01	1.24	1.53
Age x IMT	-0.01(0.01)	0.98	1.00	1.01

Note: $\chi^2(3) = 95.7$, $p = <.001$. * $p < .05$.