

The wider benefits of instrumental music learning in childhood

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1. Introduction

1.1 Introduction and Research Context

This paper is designed to provide an overview of the research literature surrounding the wider benefits of music instrumental tuition. Where possible, the research has been separated into specific sections for ease of navigation with a full bibliography at the end. In accordance with the guidelines provided by the Scottish Government, the research explored will address the following outcomes:

- help music education practitioners and policy makers understand what is out there in terms of research,
- show where there is strong evidence and conversely where evidence is weak or lacking
- enable policy makers to refer to strong evidence and use it in their thinking and in their influencing of others
- highlight areas where more research would be desirable, in order to better understand the impact and influence of music education

As defined in the report by the Scottish Government's Instrumental Music Group (2013), instrumental music tuition includes vocal tuition and, therefore, the research explores the benefits of learning to play an instrument and sing.

2. Economic and Cultural Perspective

Figures from UK Music (2013) provide the following statistics regarding the contribution of music tourists to Scotland (and the UK as a whole):

- the total tourism spend in Scotland for 2013 was £105 million; 16% of this came from overseas music tourists, the rest from domestic tourists (84%)
- festivals accounted for 60% of the total music tourism spend whilst concerts accounted for the remaining 40%
- the music tourism industry accounts for almost 250,000 full-time equivalent jobs in Scotland

Music plays an important role in Scotland's culture and contributes to the country's economy. There is clearly a committed audience for the music performance opportunities Scotland has to offer with £42 million spent on attending concerts and a further £63 million

on festivals. This suggests that music is regarded by those resident in Scotland and those visiting as an important part of Scotland's culture.

The growth of festivals such as Celtic Connections would also suggest that Scottish Traditional music remains an important part of Scotland's music landscape. From the inaugural 14 day festival at the Royal Concert Hall in 1994 attracting 35,000 people to its concerts, it has grown to an 18 day festival comprising 300 different events (concerts, ceilidhs, talks, workshops etc) across 20 different venues (CelticConnections, 2014).

With regards to culture, statistics from the Scottish Household Survey (ScottishGovernment, 2013, ScottishGovernment, 2014) show that live music events ranked second for overall attendance out of a list of 16 specific cultural events (such as visiting a museum or gallery, going to the theatre etc) in 2012 and 2013. A reported 31% of adults attended a live music event in both years and this total was only superseded by 54% of adults who reported going to the cinema in 2012 (ScottishGovernment, 2013) and 56% in 2013 (ScottishGovernment, 2014). Interestingly, opera or classical music events had their own category and were not included in the statistics for 'live music events'. In 2012, 7% of adults reported having attended an opera or classical music event as opposed to 6% in 2013. No statistics for other subcategories of live music were provided.

Although there may be some overlap between those who saw 'live music events' and 'opera or classical music events' as defined by the SHS, it can be assumed that if both categories were combined, the overall percentage of people in Scotland engaging with live music (regardless of genre) would be higher. Nonetheless, around a third of the population engaged with live music events which gives a clear indicator of the importance people place on music in Scotland.

A report by the London School of Economics and Political Science (LSE) explored the impact of 3 London conservatoires on the UK and London Economies (LSE, 2012). The report concluded that the conservatoires represent a fundamental part in developing and sustaining London as a world music centre. In addition to this, the institutions represent part of a network that provides London with benefits to the music industry that also contribute towards tourism and other creative arts and cultural industries. The current search found no equivalent report for the economic impact in Scotland of the Royal Conservatoire of Scotland (RCS), however, it is reasonable to suggest that the RCS may well play a comparable role in the development and sustainability of the music landscape in Scotland. In ascertaining the impact on the Scottish economy, an independent and detailed report would need to be conducted. What should be highlighted in both of these examples is that instrumental tuition at grass roots level marks the beginning of this entire

process. Without instrumental music provision at school, there would be substantially less pupils progressing to conservatoire level and beyond into professional employment.

It is important to acknowledge that instrumental music tuition does not exist simply to promote those students wishing to continue their musical studies in higher education. The benefits are many and varied and equally valid for pupils who ultimately progress to careers in other seemingly unrelated fields. The LSE report has been discussed to highlight one of the various ways in which instrumental music tuition plays a fundamental role in the economic and cultural benefits that the music industry brings to the UK.

A study by Lamont *et al.* (2003) provides an overview of music provision in both primary and secondary education in England. It not only reveals some interesting insights into the way music is regarded by those teaching it, and those learning it, but also explores the use and value of music outwith education. The paper highlights perceived cultural and social benefits of instrumental learning in England such as: engagement with the local community through performance and the resulting generation of energy and confidence for the pupils taking part; citizenship was also seen as an area of development through musical activities in addition to increased appreciation and respect for others, teamwork and self discipline. Within the remit of this research, no equivalent study undertaken for music provision in the Scottish education system has been found. Although much of what Lamont *et al.* reports can be generalised to Scotland, there are fundamental differences between the curricula, modes of assessment and provision.

3. Child Development Perspective

Since antiquity, music has been intrinsically linked with physical and psychological wellbeing and used as a means to heal both mind and body. The perceived benefits and indeed disadvantages to health that music can bring are found in the work of the great philosophers of Ancient Greece. Well over 2000 years later, current research is still very much grounded in many of the underlying areas of questioning that Pythagorus, Plato, Aristotle and many others since have pursued with regard to the links between music and wellbeing.

There are various ways in which music has been shown to impact on development, health and wellbeing. This section will focus mainly on the benefits brought to those receiving instrumental and vocal tuition, although there are further effects for non-recipients who

may attend resultant concerts or other performances. It is worth noting that there is a huge amount of evidence to show the benefits that music has on early child development and, furthermore, that this is arguably an important consideration when it comes to the efficacy of instrumental tuition when the child is older.

3.1. Physical Benefits

The specific use of singing in therapeutic settings, and to therapeutic ends, can be traced back deep into history. Current research has explored the physiological mechanisms by which singing is produced, such as muscle activity, subglottal pressure, diaphragmatic breathing, and the impact of posture (Watson et al., 1989, Thorpe et al., 2001, Pettersen et al., 2005). To a large extent, this can also be linked with playing a wind instrument (woodwind and brass). Results have revealed insights into the physiology behind the production of sound, pitch and intensity, and, therefore, how trained musicians use their bodies differently when performing. In addition to how the sound is produced, the resulting physiological and psychological effects, such as mental wellbeing, arousal, lung capacity and heart rate, have also been investigated (Hunter, 1999, Clift and Hancox, 2001, Valentine and Evans, 2001, Stacy et al., 2002). Gick (2011) surmised that, although research findings are often inconclusive, the results of such studies suggest that possible outcomes may include benefits to breathing and short-term immune response.

3.1.1 Neurological

The brain of a musician develops in a different way to that of a non-musician (Schlaug, 2001, Gaser and Schlaug, 2003, Musacchia et al., 2007). That is not to say that we are necessarily predetermined to fill either one of these statuses and that musical predisposition is entirely innate, but that training in music as we develop may influence the development of the brain in certain areas. However, it remains unclear as to how much of the difference in brain structure is determined by innate properties and how much by external influence.

A study by Gaser and Schlaug (2003) suggests that the long-term learning and repetition of complex auditory and motor skills used in music training actually increases the grey matter volume in motor, auditory and visual-spatial, or perirolandic, brain regions (namely, primary motor and somatosensory areas, premotor areas, anterior superior parietal areas, and in the inferior temporal gyrus bilaterally). These findings clearly show that a number of regions within the brain are activated and enhanced by musical stimuli which suggests that there is significant activity across both hemispheres in the brain where music is concerned.

This sets music apart from other activities where processing happens in a more regionalised area within the brain. Furthermore, a study by Musacchia *et al.*, (2007) suggests that this modified cortical organisation, caused by music training, extends to subcortical sensory structures that can be generalised back to the processing of speech. In other words, the effect of music training on the brain may also have an impact on linguistic processing, in this case, speech.

3.1.2. Respiratory

The controlled breathing necessary, particularly for singers and wind instrumentalists, in performing music can have positive impacts on the respiratory system. Studies have shown that singing increases breath control (which is reliant on the muscles of the trunk) and lung capacity (Clift and Hancox, 2001, Stacy *et al.*, 2002) as well as helping to alleviate symptoms which disrupt these, such as asthma (Stacy *et al.*, 2002, Eley and Norman, 2010) and chronic obstructive pulmonary disease (Bonilha *et al.*, 2009).

Lucia (1994) found that teenage asthmatic wind instrumentalists reported significantly fewer panic-fear responses and mood changes caused by asthma than teenage asthmatics who did not play a wind instrument. Therefore, the suggestion is that teenage asthmatic wind instrumentalists perceive themselves to be better able to cope with the disease and present with better 'asthma health'. It is further suggested that playing a musical wind instrument can act as a longterm therapeutic agent for asthmatics.

A recent systematic literature review (Sliwka *et al.*, 2014) suggests that the studies using music as a therapy for asthma are limited and there is a need for further research using mixed methods.

3.1.3 Motor Coordination

Studies have shown that fine motor discrimination is closely related to instrumental music training in children between 5 and 11 years. A study by Forgeard *et al.* (2008b) reports that children with 3 or more years of music instrumental training outperform those without such an experience in skills in fine motor coordination (both hands). The results support similar findings from Costa-Giomi (2005) and Hurwitz *et al.* (1975).

3.2. Cognitive Benefits

3.2.1. Intelligence

Costa-Giomi suggests that there has been a shift, during the second half of the twentieth century, in the studies of music and intelligence from how intelligence affects musicality to how musicality affects intelligence. The results of many of these studies have shown that those who excel at music generally show greater IQ and do better in other academic subjects (Costa-Giomi et al., 2012). There is robust evidence to demonstrate a relationship between learning and instrument and intellectual development (for a review, see Hetland, 2000, Hallam and MacDonald, 2013). Hetland likens the difference to one inch in height (or 84 points) on standardised school tests. However, care is needed when interpreting the outcomes of these studies: is there an argument for saying that music increases intelligence in other cognitive areas, or is it simply the case that those individuals who have the capacity to excel in music are of higher intelligence anyway? As yet, the answer to this remains uncertain and further research is necessary to provide more clarity in this area.

Rauscher *et al.* (1997) explored the effects of musical training on pre-school children's spatial-temporal reasoning and found that those receiving keyboard lessons (as opposed to computer lessons or no intervention) scored higher on spatial-temporal tasks. Costa-Giomi (1999) replicated the study and reported initial differences in spatial-temporal scores following 1 and 2 years of weekly piano study but the effect was lost after the third year. Gromko and Poorman (1998) reported significant differences between the two groups in raw scores but not the scaled scores of the Wechsler Pre-school and Primary Scale of Intelligence Revised (WPPSI-R) when the same design was used. Philbrick and Mallory (1996) reported a similar outcome.

Schellenberg (2006) suggests that formal exposure to music in childhood is associated positively with IQ. Furthermore, those who experienced music training scored better on numeracy and literacy tasks than those who did not receive the training. A study by Rauscher and Hinton (2006) suggests that children provided with instrumental instruction scored significantly higher on tests that measure spatial-temporal cognition, hand-eye coordination and arithmetic.

3.2.2. Language

Musical skills have been shown to correlate highly with phonological awareness (Anvari et al., 2002) and the benefits that music brings to a child's language development ultimately contributes towards, and even predicts (Lamb and Gregory, 1993), his later reading ability. Indeed, there has been shown to be a strong relation between children's early knowledge of nursery rhymes (at age 3) and success in reading and spelling over the next 3 years (Bryant et al., 1989). Although these studies focus on preschool or primary children, they represent a strong case for the continuity of opportunities in music within formal education which, for some, will include instrumental tuition. It would be interesting to track the progress pupils make in instrumental tuition in relation to the previous musical opportunities they have had within formal education to see if the many and varied benefits that instrumental tuition brings can be increased.

With specific regard to instrumental tuition, an Australian study (Rickard et al., 2010) found that group string lessons had a significant impact on the learning and immediate recall of verbal information for children aged 8 years. Moreno and Besson (2006) also concluded that 8 weeks of music training with children aged 8 years increased their cognitive processing with regard to the detection of pitch changes in language.

There are a number of recent studies that evidence the link between musical ability and second language production and discrimination skills (Moreno and Besson, 2006, Milovanov et al., 2008, Delogu et al., 2010, Milovanov et al., 2010); and musical ability and first language production and discrimination skills (Magne et al., 2006). Learning to play a musical instrument has also been shown to enhance verbal memory (Chan et al., 1998, Ho et al., 2003).

Playing a musical instrument has been found to trigger changes in the brainstem in addition to the cortex according to a study by Musacchia, Sams, Skoe, and Kraus (2007). They report that musicians had earlier brainstem responses to the onset of a syllable than non-musicians and that a musician who had been learning since the age of 5 demonstrated quicker responses and increased activity of neurons in the brain to both music and speech sounds. This would suggest that the longer the musician had been playing, the greater the benefit. Musicians were shown to have high-functioning peripheral auditory systems and, therefore, superior encoding abilities in linguistic sounds.

Research exploring the relationship between music and language is a growing area within the neuroscience community and the results thus far are by no means conclusive. What is evident from the current literature is that, although music and language are associated with different regions of the brain, there seems to exist a certain amount of overlap between the processing of musical and linguistic concepts. This suggests that not only do music and

language share certain neural processes, the skills in one domain may be able to enhance or even predict skills in the other.

3.2.3. Numeracy

There has been a longstanding assumption that a strong link exists between music and mathematical ability. Hallam (2010) argues that quasi mathematical processes are used daily by musicians when decoding musical notation (such as sub-division of beats and rhythm) however, the benefits that music brings to mathematical skill are only evident when the skills required are 'near'. In other words, music benefits mathematical skills in specific and not general ways. Vaughn (2000) offers some support for the links between music and mathematics but only where the learning of music uses mathematical concepts (for example, ratios and time signatures; subdivision and note lengths etc). Other studies have found similar links (Rauscher et al., 2005, Rauscher and Hinton, 2006, Schellenberg, 2006)

In the US, Cheek and Smith (1999) found that students aged between 13 and 14 years (8th graders) who had 2 or more years of (private) instrumental tuition performed better on the mathematics section of the Iowa Test of Basic Skills (ITBS) than did students who did not receive private tuition. Furthermore, those that received keyboard lessons had significantly higher scores on the ITBS than those learning instruments other than keyboard. What is becoming increasingly evident from the current research is that music can enhance mathematical skills but only where there is a crossover in terms of the neural activity involved in each pursuit.

3.2.4. Learning Difficulties

Music has a long association with therapeutic benefits for children with learning difficulties. It is important to distinguish the practice of Music Therapy delivered by a Music Therapist from the therapeutic benefits that music can bring when delivered by an instructor or facilitator in music. Music, and specifically the opportunity to learn an instrument, can play an enormously important role for children, regardless as to whether they have a learning difficulty or otherwise. For this reason, there is a strong argument that it should be accessible to all (for a review, see Moscardini et al., 2013).

Much of the research in this area focuses on using music intervention for therapeutic gains and does not offer a huge amount with specific regard to ongoing instrumental tuition.

There seems to be a lack of studies exploring the impact of instrumental tuition for those with autistic spectrum disorder (ASD) and Asperger's syndrome which is perhaps surprising given that the latter condition is not uncommon within a mainstream educational setting. One condition that has received attention within the research literature is dyslexia.

The rhythmic aspects of musical training have been shown to support the language difficulties associated with dyslexia (Overy, 2000, Overy et al., 2003). Overy *et al.* (2003) found that children with dyslexia have difficulties with rhythmic, not pitch, related skills and tuition focusing on rhythm had a positive impact on phonological and spelling skills, in addition to general musical ability.

Forgeard *et al.* (2008a) reports that music discrimination skills in children with dyslexia predicted phonological skills, which in turn predicted reading skills. The findings indicate that musical intervention (including instrumental tuition) that strengthens the basic auditory music perception skills of children with dyslexia may also remediate some of their language deficits. The use of music, including instrumental playing, was also shown to significantly improve the skills of 2nd Grade children (aged 7-8) with a specific learning disability in reading and word decoding, word knowledge, and reading comprehension tasks (Register et al., 2007).

4. Personal and Social Perspective

Harland *et al.* (2000) report that the "most frequent overall influences on pupils derived from engagement with the arts in school were related to personal and social development. In music there were perceived effects relating to awareness of others, social skills, well-being and transfer effects" (as quoted in Hallam, 2010).

Many of the studies that explore links between music and self-esteem and self-confidence rely on self-reporting, i.e. the individual rating their own levels. This provides an insight into personal opinion and perceived benefits of music from those that are experiencing it. Research into the importance of music for the individual is growing with areas such as musical identity, music in adolescence, and links between music and self-esteem all becoming popular among researchers.

Music has been shown to play a key role in self-identity for adolescents (North et al., 2000, MacDonald et al., 2002) and a study by Steitz and Owen (1992) found that adolescent girls who were involved in music or who played a musical instrument rated themselves as having higher self-esteem than those who were not involved. A study by Costa-Giomi (2004) found similar results where 3 years of piano tuition showed a positive effect on self-esteem.

Group performing has been shown to promote friendships with like-minded people, promote social and personal skills in general, and provide an outlet for relaxation and enjoyment for non-music university students according to Kokotsaki and Hallam (2011). Although the research targeted students in higher education, the instrumental / vocal skills that the university student possesses is a direct result of instrumental tuition in primary and secondary education. The effects of group singing have been explored in relation to mental wellbeing (Unwin et al., 2002, Bungay et al., 2010, Clift and Morrison, 2011) which would suggest that there is an expectation that participants may stand to gain further from the activity of singing due to the social aspect.

A recent German study by Frankenberg *et al.* (2014) reports that music training can have a positive impact on the acculturation process in migrant children. Students who received instrumental lessons, and engaged with accompanying activities (such as bands and orchestras etc) showed greater increases in orientation to mainstream culture over a period of 18 months than control students who had not received the extended music tuition.

5. Key Papers

5.1. General Overview of the benefits of instrumental instruction

Hallam S and MacDonald R. (2013) Introduction: Perspectives on the power of music. *Research Studies in Music Education* 35: 83-86.

Hallam S. (2010) The power of music: Its impact on the intellectual, social and personal development of children and young people. *International Journal of Music Education* 28: 269-289.

Lamont A, Hargreaves DJ, Marshall NA, et al. (2003) Young people's music in and out of school. *British Journal of Music Education* 20: 229-241.

Hetland L. (2000) Learning to make music enhances spatial reasoning. *Journal of Aesthetic Education* 34: 179-238.

5.2. Discipline Specific Benefits

5.2.1. Voice

Clift and Morrison (2011); Bungay *et al.* (2010); Unwin *et al.* (2002)

- participation in group singing has been found to be beneficial to mental wellbeing

Gick (Gick, 2011)

- studies suggest that singing may be beneficial to breathing and short-term immune response

Bonilha *et al.* (2009)

- singing helps to alleviate symptoms of chronic obstructive pulmonary disease (COPD)

Schellenberg (2004)

- reported that 6 year old pupils receiving Kodály vocal instruction showed small increases in IQ and that comparable non-music activities (drama and no intervention) did not have the same consequence

Stacy *et al.* (2002); Eley and Norman (2010)

- singing helps to alleviate symptoms of asthma

Clift and Hancox (2001); Stacy *et al.* (2002)

- singing increases breath control and lung capacity

5.2.2. Keyboard

Costa-Giomi (2005)

- a significant improvement in fine motor coordination (both hands) was found in children who had received piano instruction for 2 years

Costa-Giomi (2004)

- 3 years of piano tuition showed a positive effect on pupils' self-esteem

Costa-Giomi (1999)

- replicated Rauscher *et al's* (1997) and found that those receiving keyboard instruction for 3 years scored higher in spatial-temporal tasks for the first 2 years but the effect was lost after the 3rd year

Cheek and Smith (1999)

- students aged 13-14 receiving keyboard instruction performed significantly better on mathematics tasks than those learning an instrument other than keyboard

Rauscher *et al.* (1997)

- Preschool children in the USA (aged 3-5) showed increased scores in spatial-temporal reasoning after keyboard instruction

5.2.3. Wind Instruments

Lucia (1994)

- playing a wind instrument and better management of asthma related symptoms

5.2.4. String Instruments

Rickard *et al.* (2010)

- group string lessons have a significant impact on the learning and immediate recall of verbal information for children

5.2.5. Percussion Instruments

Rauscher *et al.* (2005)

- children receiving instruction on rhythm instruments have been shown to score higher on maths tests than those receiving piano and singing tuition

Overy *et al.* (2003); Overy (2000)

- rhythmic aspects of musical training have been shown to support the language difficulties associated with dyslexia

5.3. Context Specific Benefits

5.3.1. Physical Benefits

Gaser and Schlaug (2003)

- long-term learning and repetition of complex auditory and motor skills used in music training actually increases the grey matter volume in motor, auditory and visual-spatial brain regions

Clift and Hancox (2001); Stacy *et al.* (2002)

- singing increases breath control and lung capacity

Stacy *et al.* (2002); Norman (2010)

- singing can help to alleviate symptoms which disrupt breath control and lung capacity, such as asthma

Lucia (1994)

- teenage asthmatics perceive themselves to be better able to cope with asthma and present with better 'asthma health' as a result of playing a wind instrument
- playing a musical wind instrument can act as a longterm therapeutic agent for asthmatics

Forgeard *et al.* (2008b); Schlaug *et al.* (2005); Costa-Giomi (2005); Hurwitz *et al.* (1975)

- fine motor discrimination is closely related to instrumental music training in children

5.3.2. Cognitive Benefits

Rauscher and Hinton (2006)

- children provided with instrumental instruction scored significantly higher on tests that measure spatial-temporal cognition, hand-eye coordination and arithmetic

Schellenberg (2006)

- formal exposure to music in childhood is associated positively with IQ

Hallam and MacDonald (2013); Hetland (2000)

- robust evidence to demonstrate a relationship between learning and instrument and intellectual development

Anvari *et al.* (2002); Lamb and Gregory (1993)

- musical skills correlate highly with phonological awareness and can contribute towards language development

Rickard *et al.* (2010)

- group string lessons have a significant impact on the learning and immediate recall of verbal information for children

Milovanov *et al.* (2008, 2010); Delogu *et al.* (2010); Moreno and Besson (2006)

- link between musical ability and second language production and discrimination skills

Magne *et al.* (2006)

- link between musical ability and first language production and discrimination skills

Ho *et al.* (2003); Chan *et al.* (1998)

- learning to play a musical instrument has also be shown to enhance verbal memory

Musacchia *et al.* (2007)

- earlier brainstem responses to the onset of a syllable as a result of playing a musical instrument
- musicians were shown to have high-functioning peripheral auditory systems and therefore superior encoding abilities in linguistic sounds

Schellenberg (2006); Rauscher and Hinton (2006); Rauscher *et al.* (2005); Vaughn (2000)

- links between music and mathematics but only where the learning of music uses mathematical concepts (for example, ratios and time signatures; subdivision and note lengths etc)

Cheek and Smith (1999)

- students aged 13-14 receiving keyboard instruction performed significantly better on mathematics tasks than those learning an instrument other than keyboard

Overy *et al.* (2003); Overy (2000)

- rhythmic aspects of musical training have been shown to support the language difficulties associated with dyslexia

Forgeard *et al.* (2008a)

- musical intervention (including instrumental tuition) that strengthens the basic auditory music perception skills of children with dyslexia may also remediate some of their language deficits

5.3.3. Personal and Social Benefits

Frankenberg *et al.* (2014)

- music training can have a positive impact on the acculturation process in migrant children

Kokotsaki and Hallam (2011)

- group performing has been shown to promote friendships with like-minded people, promote social and personal skills in general, and provide an outlet for relaxation and enjoyment for non-music university students

Costa-Giomi (2004)

- 3 years of piano tuition showed a positive effect on pupils' self-esteem

Harland *et al.* (2000)

- the most frequent overall influences on pupils derived from engagement with the arts in school were related to personal and social development. In music, there were perceived effects relating to awareness of others, social skills, well-being and transfer effects

Steitz and Owen (1992)

- adolescent girls who were involved in music or who played a musical instrument rated themselves higher in self-esteem than those who were not involved

6. Summary and directions for future research

The research literature shows that there are wide-ranging benefits of instrumental music education for preschool and school children. Benefits to literacy, numeracy, cognition, spatial-temporal reasoning, fine motor coordination and physical and mental wellbeing, and even the amount of grey matter in the brain, have all been linked with learning to play a musical instrument. Although many of the studies referenced provide an overview of the known effects of music training on non-musical tasks, a very small percentage of them specifically relate to instrumental tuition in Scottish education and the wider benefits it brings. By the very nature of the statistical analysis involved in the studies within the current research literature, the results are deemed to be robust enough to generalise to most settings. However, it would be interesting to explore specifically the impact of

instrumental music tuition on other areas of the *Curriculum for Excellence* and the development of the pupils within the Scottish Education system. It is also of great importance that the musical benefits of instrumental tuition are recognised and that music is seen as an important subject within its own right, regardless of the non-musical benefits it may bring.

From the overview of research provided in this paper, the following areas of exploration are suggested:

2. Scotland is regarded as a nation that shows others the way with regards to instrumental music services yet there is very little academic research surrounding its impact (whereas comprehensive reviews exist for other regions in the UK and internationally). Research should explore the impact of music tuition on other areas of learning and development specifically within the *Curriculum for Excellence* to provide a point of comparison on a national and international level
3. Can the non-musical benefits brought to students by the instrumental music services in Scotland be viewed in isolation or is it necessary to take a more holistic view of the music provision throughout a child's formal education? Furthermore, if a holistic view is taken, how does previous musical experience (early years and lower Primary) affect the efficacy of future instrumental instruction?
4. Research should look into the economic and social impact of school instrumental tuition in relation to the music landscape for both performers and audiences in Scotland; the instrumental music service is providing tuition not just for the current and potential performers but also the current and future audience members
5. Further research should explore the effects of instrumental music training on children with Additional Support Needs (both in mainstream and ASN environments) and the different approaches used by instructors
6. Research should explore the non-musical benefits associated with instrumental music tuition as distinct from other aspects of music education within formal education

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