Poster Abstracts

P1: Music and Neurological Disease

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Review papers: At the present time, music surrounds us and is available for every one. We are thinking that music is used only for pleasure, dancing, singing, recalling the past times or the people we met on our way years ago. Nowadays we noticed the influence of the music for the neurological disorders. We can see the positive and negative influence of music for the human live. Negative sides of music are musician's dystonia, musicogenic seizures and auditory hallucinations in schizophrenia. As the positive aspects – music rehabilitation is the promising form of rehabilitation for the patient with aphasia, dementia and after stroke. In case of diseases like Parkinson disease and Huntington disease the most hopeful procedure seems to be rhythmic auditory stimulation. Unfortunately, we must remember that such rehabilitation must be conducted by persons adequately trained because it is easy to cause opposite effect than intended.

P2: Contribution of sound reproduction and naming to auditory recognition memory of non-speech sounds

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Compared to non-human primates, humans have remarkably better long-term auditory recognition memory. This raises the question of whether the human ability to remember non-speech sounds is supported by mnemonic strategies derived from our language expertise, such as verbal semantic naming and oromotor reproduction of sounds. This experiment evaluated the

hypothesis that sound reproduction and naming contribute to auditory memory of non-speech sounds. We tested the ability of 80 participants to recognize previously learnt non-speech sounds that varied in the degree to which they could be named or reproduced. Four groups of participants either reinforced or suppressed the reproduction or naming of stimuli during the learning phase. Participants had significantly lower recognition performance with sounds that could be neither reproduced nor named, and participants in the enhancement groups outperformed the participants in the suppression groups, suggesting that sound reproducing and naming contribute to auditory recognition memory of non-speech sounds. The findings support the idea that auditory long-term memory and language share an interdependent relationship and that the skills that evolved to support language ability facilitate auditory memory in general.

P3: A Pavarotti is not a Mozart: singers outperform instrumentalists on phonetic language learning tasks

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Introduction

Recent findings have shown that people with higher musical aptitude were also better in oral language imitation tasks. However, whether singing capacity and instrument playing contribute differently to the imitation of speech has been ignored so far. Research has just recently started to understand that instrumentalists develop quite distinct skills when compared to vocalists. In the same vein the role of the vocal motor system in language acquisition processes has poorly been investigated as most investigations favour to examine speech perception.

Objectives

We set out to test whether the vocal motor system can influence the ability to phonetically learn, produce and perceive new languages.

Materials & Methods

We contrasted 96 German native speaking instrumentalists, vocalists and non-vocalists/ non-musicians. Twenty-seven instrumentalists, thirty-three vocalists and thirty-six non-musicians/non-singers were tested for their linguistic abilities (repeat an unknown language (Hindi)) and their musical aptitude.

Results

Results revealed that both instrumentalists and vocalists have a higher ability to repeat unintelligible/unknown speech than non-musicians/non-singers. Within the musician group, vocalists outperformed instrumentalists significantly.

Conclusion

Adaptive plasticity for speech imitation is not reliant on audition alone but also on vocal-motor induced processes. Second, vocal flexibility of singers goes together with higher speech imitation aptitude. Third, the oromotor system may be involved in laying down memory of acoustic speech signals and higher vocal ability may speed this process up.

P4: The role of the right inferior gyrus in the processing of nonlocal dependencies in music

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Introduction

Much of the prior literature on the syntactic processing of music suggests that music is processed locally. However, recent experiments demonstrate that humans also perceive and

process nonlocal dependencies in music. This is mirrored by the extensive use of structure in Western classical music, which are instantiations of such nonlocal dependencies. Nevertheless, the functional localization of brain systems that process nonlocal musical syntax is unclear. This experiment aimed to identify brain regions involved in the processing of nonlocal dependencies in music by using nested tone sequences.

Objectives

Using an artificial grammar learning approach and fMRI, participants were asked to judge the grammaticality of nested musical sequences.

Materials & Methods

Data were collected from 17 musicians (7 male) over two sessions. In the first, participants were trained to extract the underlying grammar from center-embedded tone sequences with random local transition probabilities. Embedded sequences ranged from 0- to 2-levels of embedding. Training followed an auditory starting-small paradigm with positive exemplars. Participants who successfully acquired the grammar were invited to a second session, where they underwent functional scanning in a 3T-fMRI scanner. Participants were asked to determine the grammaticality of 180 new auditory stimuli with the same relation.

Results

Statistical analysis employed a factorial design with the factors 'Grammaticality' (ungrammatical/grammatical) and 'Length' (1-/2- levels of embedding). There was no significant interaction between the factors. A main effect of 'Grammaticality' was observed in the bilateral inferior frontal gyrus (with a right-hemispheric dominance), right middle frontal gyrus, bilateral insula, middle temporal gyrus, and the supplementary motor area, where ungrammatical musical sequences elicited a higher BOLD response compared to grammatical sequences. A main effect of 'Length' was observed in the bilateral inferior parietal lobule (including right angular gyrus) and right middle frontal gyrus for sequences with 2-levels of embedding compared to 1.

Conclusion

Our experiment establishes the functional neuroanatomy of the processing of nested musical sequences in musicians, with a prominent role in the right inferior frontal gyrus. This finding complements results from previous neuroimaging studies on the processing of local dependency violations in music, and suggests a generic function of the right inferior frontal gyrus in processing musical syntax. Moreover, it suggests that the functional neuroanatomy of musical syntax is a mirror image of the functional neuroanatomy of natural language syntax, where violations of embedded sentences were observed to activate the left inferior frontal gyrus.

P5: Revisiting the maestro: variability of practice enhances neuromuscular control of dexterous finger movements in piano performance

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Introduction

In sports and musical performance, it has been prevalent to practice a novel motor skill in a variety of spatiotemporal contexts. For instance, over centuries, musicians have practiced a targeted motor skill with various rhythm, speed, and loudness, with a belief that such “variability of practice (VOP)” can facilitate acquisition of the skill. However, to date, there is no convincing empirical evidence in favor of the concept of VOP.

Objectives

The present study aimed at addressing effects of practicing with various rhythms on speed, accuracy, and neuromuscular efficiency of sequential finger movements during piano performance.

Materials & Methods:

Thirty pianists were asked to practice a short sequence with the right hand over 5 trials. They were randomly assigned into 3 groups with different practice conditions; (1) practicing the sequence without altering the target rhythm (normal practice: NP), (2) practicing with 4 rhythms different from the target one (VOP), and (3) no practice (i.e. rest: RT). The practice session lasted for 10 min. A test session was conducted before and after the practice session, in which each player played the target sequence with each of 4 different tempi (i.e. slow, medium, fast, and as fast and accurate as possible) over 5 successful trials.

Timing and velocity of each keystroke was recorded from the digital piano, whereas activities of 5 intrinsic hand muscles were recorded using a novel surface electromyography (EMG) with miniature electrodes. The measured muscles were abductor policis brevis (APB), first, second, third, and fourth dorsal interossei (1DI, 2DI, 3DI, and 4DI, respectively), and abductor digiti minimi (ADM).

Results

The result demonstrated a shorter inter-keystroke interval at the posttest as compared to the pretest for the VOP group ($p<0.05$), but not for the NP and RT groups. This indicated faster piano performance specifically following the VOP. In addition, the peak EMG activity displayed a larger decrease following the practice with the VOP than the RT, particularly at some DI muscles when playing at slow and medium tempi.

Discussion

The present results demonstrated effects specifically of VOP on both maximum speed of piano performance and muscular activity of hand intrinsic muscles. It is therefore likely that VOP, being originally established by a legendary French pianist “Alfred Cortot”, provides a unique way of facilitating and economizing dexterous finger movements during music performance.

P6: “When music speaks”: the role of auditory cortex morphology in language aptitude

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Introduction

In the past years, research focusing on language aptitude and its various subcomponents has gained increasing interest in numerous fields such as pedagogy and neurosciences. Unfortunately, recent studies focusing on language aptitude have only partly succeeded in showing whether aptitude is a purely innate capacity and to what extent it contributes to language excellence. According to recent studies [8-10], intense musical training in childhood is related to the brain’s linguistic organization and the functional interplay of right and left auditory cortex. Recently, a set of neuroanatomical markers has been identified in children with high musical expertise and aptitude, including (a) enlarged Heschl’s gyri, (b) shorter latencies of the primary auditory evoked response complex and (c) a better synchronization of left and right auditory cortex activation. Studies on language have shown that the greater the general musical aptitude, the better the foreign language pronunciation skills [1-6]. L2 learners with high pronunciation aptitude also have significantly lower BOLD activation in speech-motor and auditory-perceptual networks.

Objectives

Given that the gross morphology of the auditory cortex is also important for speech learning and expertise [5], we hypothesized that its macro-anatomic structure could give cues about the neuroanatomical correlates of speech-language aptitude.

Materials & Methods:Using Brain Voyager QX software for semiautomatic segmentation of the auditory cortex (as in [10]) and cortical thickness analysis, we segmented and analysed T1 weighted MR images the primary auditory areas (bilateral Heschl's gyri and plana temporale) in a group of 26 special individuals of either very high or very low (n=13 per group) speech imitation aptitude based on extensive pretesting for linguistic, musical and psycho-cognitive abilities [1,4]).

Results

We found characteristic macro-anatomic differences between individuals with high and low speech imitation aptitude. In line with previous findings that musical aptitude is related to neuroanatomical markers in auditory cortex (e.g. Heschl's gyrus, as shown in 7-10) we now identified similar markers in auditory cortex in individuals with high language aptitude for speech imitation/pronunciation. Moreover, systematic relationships were observed between structural anatomy and functional connectivity measures.

Conclusion

This leads us to the conclusion that neuroanatomic markers of speech / language aptitude (oral speech imitation in this case) can be linked to classical auditory areas formerly connected to musical aptitude and expertise. This shows that abilities in the domains of music and speech (specifically in pronunciation) do not only overlap and correlate behaviourally, but also might share common grounds in the neuroanatomy of primary auditory areas.

References

[1] Dogil, G., and S.M. Reiterer, eds. (2009), Language Talent and Brain Activity. Berlin, New York: De Gruyter.

[2] Hu, X., et al. (2013), 'Language aptitude for pronunciation in advanced second language (L2) Learners: Behavioural Predictors and neural substrates', Brain and Language, vol. 127, no. 3, pp. 366-376.

[3] Hu, X., S.M. Reiterer and H. Ackermann (2008), 'The neuropsychology of second language (L2) pronunciation talent', International Journal of Psychology, vol. 43, no. 3, p. 315.

[4] Reiterer, S.M., et al. (2011), 'Individual differences in audio-vocal speech imitation aptitude in late bilinguals: functional neuro-imaging and brain morphology', Frontiers in Psychology, vol. 2, no. 271, doi: 10.3389/fpsyg.2011.00271

[5] Golestani, N., C. J. Price and S. K. Scott (2011), 'Born with an Ear for Dialects? Structural Plasticity in the Expert Phonetician', Journal of Neuroscience, vol. 31, no. 11, pp. 4213-4220.

[6] Reiterer, S.M., et al. (2009), 'Measuring second language proficiency with EEG synchronization: How functional cortical networks and hemispheric involvement differ as a function of proficiency level in second language speakers', Journal of Second Language Research, vol.25, no. 1, pp. 77-106.

[7] Schneider, P., et al. (2002), 'Morphology of Heschl's gyrus reflects enhanced activation in the auditory cortex of musicians', Nature: Neuroscience, vol. 5, no. 7, pp. 688-694.

[8] Seither-Preisler, A., and P.Schneider (2013), 'Neurokognitive Aspekte musikalischer Begabung'. In: W. Gruhn and A. Seither-Preisler eds. Der musikalische Mensch. OLMS-Verlag Hildesheim.

[9] Seither-Preisler, A., and P. Schneider (2014), 'Positive Effekte des Musizierens auf Wahrnehmung und Kognition aus neurowissenschaftlicher Perspektive'. In: Kreutz, G. ed. Musik und Medizin. Spektrum Verlag.

[10] Seither-Preisler, A., R.Parncutt, and P.Schneider (2014), ‘Size and synchronization of auditory cortex promotes musical, literacy and attentional skills in children’, Journal of Neuroscience, vol. 34, no. 33, pp. 10937-49.

P7: Sexual arousal and rhythmic synchronization: a possible effect of vasopressin

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Introduction

Perhaps having an ancestral role in courtship displays, music is a reliable indicator of cognitive and motor abilities, thus an index of good genes. Neuroendocrine evidence suggests that courtship behavior is triggered and driven by neuropeptides, among others, vasopressin (AVP). Genetic studies have linked the phenotypes of AVP’s receptors to musical ability, dance, and courtship, while neuroimaging studies have documented the presence of AVP receptors in the putamen, a structure involved in beat perception as well as prediction and continuation of simple rhythms and dance.

Objectives

Considering that sexual arousal triggers the endogenous release of AVP, this pilot study explores the relationship between sexual behavior and music. It is expected that higher levels of AVP improve rhythmic synchronization.

Materials & Methods

A USB midi keyboard connected to a MacBook Pro running Logic Pro X was used for recording rhythmic synchronization. One male subject (age 32, right handed) was instructed to tap with his dominant finger over a metronome for 11 different tempi (120 ± 5, 10, 15, 20, and 25 bpm). A

number of 36 sessions were recorded in three conditions: pre- (N=11), post-orgasm (N=11), and control condition (N=14). Pre- and post-orgasm conditions required self manual penile stimulation until the sexual arousal was reached. Once aroused, the subject performed the pre-orgasm task. Then, he continued the stimulation until ejaculation occurred. After 3 minutes of rest, he could perform the post-orgasm task. Inter-ejaculation time, the duration of penile stimulation, and the hour of the day were recorded. The subject was instructed to abstain from food and drinks other than water for at least 90 min before the tasks.

Results

Data was imported into MATLAB. The onset of tapping was extracted and then subtracted to the onset of the metronome, assuming that lower values are indices of best performances. A *t-test* showed no differences between pre- and post-orgasm task ($t(3858)=0.80$, $p=0.42$), thus they were grouped into a single variable for analysis. A one-way ANOVA revealed a significant effect of sexual arousal on tapping ($F(1,3750)=79.40$, $p<.0001$). A *t-test* between conditions per each tempo showed better performances for the tempi between 105 and 130 bpm (105-120bpm, $p<.0003$; 125bpm, $p=.01$; 130bpm, $p=.004$). Regardless of arousal, a *t-test* show a significant effect of circadian levels of AVP, improving rhythmic performances after 15:00 h ($t(5750)=7.120$, $p<.0001$).

Conclusion

Perhaps due to vasopressinergic activity in the putamen, sexual arousal improved rhythmic synchronization. This is the first report on the link between sexual arousal and musical/rhythmic skills, and thus, a more systematic research with larger samples is needed.

P8: Investigating the postural stability of musicians

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Introduction

A balanced weight distribution between both right and left side of the body is a basic prerequisite in music performances for economic body movements. Some instruments, however, demand particular body stabilisations and postural regulations to compensate for an asymmetric weight of the instrument or in specific playing positions. Previous studies found differences in the body weight distribution of violinists in different playing positions such as standing, sitting, or sitting left and right to a music stand (Spahn, Wasmer, Eickhoff & Nusseck, 2014).

Objectives

Based on these findings, the research question of this study was if a measuring of the body weight distribution and the postural stability of musicians (without carrying the instrument) will identify possible instrument-related differences.

Materials & Methods

The method of measuring static posturographic behavior with a pressure platform (Zebris) was used. Participants had to stand with open eyes on the platform for 20 seconds first with arms alongside the body and second with arm frontally stretched out in 90° angle to the body. During the measurement the sway of the center of pressure (COP) and the weight distribution between right and left body side were recorded.

127 music students at the University of Music Freiburg participated in this study. For analyzing instrument-related differences the instruments were distributed in instrumental groups. A control group of 44 medical students without instrumental experiences was used to compare differences.

Results

The analyses showed significant differences in the postural sway and the general body weight distribution between the instrumental groups. The control group reduced the amount of sway of the COP in the condition with outstretched arms. This was to be expected as outstretching the arms normally increases the general muscular tension of the body and therewith decreases the swaying amplitude. Interestingly the higher strings, the vocalists and the woodwind instruments showed no reduction of the COP sway amount in the outstretched arms condition. Furthermore, pianists and the higher strings showed a shifted weight distribution more to the left and the lower strings more to the right compared to the control group.

Conclusion

The results indicate that there are instrument-related postural patterns which even persist outside of situations of music performance. The different sway behavior of the higher strings, the vocalists, and the woodwind instruments could be attributed to the wide experience of playing and practicing in standing positions.

Literature

Spahn, C., Wasmer, C., Eickhoff, F. und Nusseck, M. (2014) Comparing violinists' body movements while standing, sitting, and in sitting orientations to the right or left of a music stand. Medical Problems of Performing Artists, 29, 86-93

P9: Music in the hands: ERP and fMRI evidence of pianists' sensitivity to musical syntax during silent production

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Music involves listening, playing and creating. Across ages and cultures, humans display a natural ability to auditorily predict what is coming next in music. However, not everybody is able to play the piano like Martha Argerich and to improvise like Bill Evans. While the neural mechanisms of movement optimization through intensive training have been widely studied, little is known whether on top of their motor skills pianists develop sensitivity to the syntactic organization of music, such as harmony, to additionally improve accuracy and flexibility of performance. We investigated this issue with three experiments.

Experiment 1 (EEG) distinguishes motor planning of the syntactic content of a cadence from the mere movement selection (fingering employed for the execution). Classical pianists mutely imitated the movements of a hand (presented as photo series) performing 5- or 2-chord (long/short context) sequences. The last chord was manipulated in terms of syntax (syntactically expected/unexpected chord) and manner (conventional/ unconventional fingering). Compared to congruent chords, the execution of syntactic violations showed a larger response delay in the long than in the short context, while the execution of the manner violations showed no context-dependent delay, suggesting two distinguishable hierarchical stages of motor planning. Accordingly, a late posterior negativity in the long context was specifically linked to re-programming of movements in terms of syntactic content, and different from the ERP elicited by unconventional fingering. These data show that pianists plan ahead what to play (the syntactic content) based on the contextual information and step-by-step select the appropriate movement for the execution.

Experiment 2 (EEG) shows with the same experimental setting that the type of musical training (jazz vs. classical) shapes motor planning at the syntactic level (earlier posterior negativity in jazzists), rather than at the movement selection level.

Experiment 3 (fMRI and seed-based functional connectivity at rest) compares the neural substrates of motor and auditory processing of syntax violations. Neural networks composed of sub-regions within the right inferior frontal gyrus interlinked with modality-specific visuo-motor parietal and auditory temporal areas were respectively recruited.

Altogether, these findings indicate that in music production planning occurs beyond the minimal production unit at longer time-scale (syntactic relationships), and is influenced by training type. Ultimately, fronto-parietal connections may be the key for skilled pianists to precisely and quickly integrate movements during performance, like we all easily do with sounds during listening.

P10: A grammar of bodily gestures within the singing lesson

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Introduction

Converging in this study is my research over several years' time on the observation and analysis of the singing lesson considered as the physical and mental "place" (in the Winnicottian sense) in which a complex practice consisting of gradually transforming the voice into voiceinstrument (by which I mean, the voice when considered as being a musical instrument) is activated and transmitted.

Objectives

Discovering, analyzing and classifying–among other things–the languages specific to the different aspects of the teaching-learning of singing. What are the dynamics proper to the teachinglearning of the only musical instrument escaping the visual and tactile senses (since

incorporated into its performer, with all the perceptual-cognitive consequences that involves) as compared to the dynamics proper to other wind instruments? How does nonverbal language function in this specific kind of learning? Here I focus on the use of the teacher's and the student's hands within the singing lesson. At what point are those gestures most used within the different periods of the "didactic sequence" of the singing lesson? To solve what problems? How?

Materials & Methods

For several years, adopting a phenomenological approach based on a longitudino-transversal methodology, I have engaged in filmed clinical observations of singing lessons on a weekly basis in Paris. My goal was to reconstitute and analyze the mosaic composed of the psychodynamic processes underlying the learning of singing. I observed students of all ages, every musical style, every level, but with a preference for beginners, so as follow improvement made over time.

Results

According as they are performed by the teachers to attain different didactic objectives or by the students themselves, the gestures are very numerous and diversified in the singing lesson. The language of gestures is a language parallel to that of the voice, whence its great usefulness during a singing course. It is found that each teacher has his or her own gestural language, while one finds very similar gestures in very different students.

Conclusions

Gestures improve rational and perceptible (felt) communication and make indispensable understanding possible, even during the act of singing. The quality of the didactic relation also depends on the quality of the co-construction of a rich and varied gestural code accompanied by metaphors playing the role of mnesic recall. That is part of a genuine "Grammar of gestures" having its own rules. Here I shall present a "Grammar of gestures of the singing lesson".

P11: Neuroplasticity or predisposition: a longitudinal study of auditory cortex morphology in musicians

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Introduction

Auditory cortex (AC) of professional musicians has been shown to substantially differ in grey matter volume as compared to non-musicians (Schneider 2002). Whether these differences represent the result of intense musical training or are attributable to innate predisposition can only be clarified in a longitudinal study design.

Objectives

Here we present our results of grey and white matter morphology in the AC of musicians during their professional musical education over 3 years.

Material & Methods

36 musicians from Basel Music University were recruited at the beginning of their bachelor program. In addition, a control population of medical students matched for age, gender and

musical aptitude as measured by the AMMA-Test (Gordon 1998) was selected. Both groups exhibited a similar musical training intensity during childhood and early youth, but significantly diverged in this respect during later adolescence and early adulthood, when they started their respective professional education. Experiments were conducted at three timepoints separated by 12-15 months for the musicians and at two timepoints for the control group. A 3 Tesla MR-scanner was used to acquire high-resolution T1-weighted three-dimensional MR images of the brain. Imaging data was normalized and analyzed with BrainVoyager software. Individual semi-automated segmentation of superior temporal gyrus with subsequent 3D surface reconstruction was performed to extract substructures of AC (Schneider 2005).

Results

Analysis of individual cortical surface structure showed high morphological variability of AC related to frequent occurence of HG duplications in both groups. Individual morphometry revealed no significant group-specific or inter-hemispheric volume differences, in grey or white matter volume of AC in both groups at the baseline measurement. Neither after 1-2 nor after 3 years, any significant group-differences of grey or white matter volume could be observed in any subareas of AC, including HG, HG duplications and PT.

Conclusion

The overall extended size of HG in combination with frequently occuring HG duplications are consistent with previous observations in musicians (Rademacher 2001, Schneider 2002). Our data suggest that all study subjects started out with a similar neuroanatomical disposition. However, after 3 years of intense musical training no significant neuroplastic changes could be found, despite individually performed segmentation and subsequent morphometry of the anatomical data. Thus, we propose that the characteristic AC morphology in musicians is either attributable to an innate predisposition or a result of early neuroanatomical development in childhood due to maturation prior to the outset of formal musical training (Seither-Preisler 2014).

Adult training-induced auditory neuroplasticity might be observable rather on a microanatomical or functional level.

References

Gordon, E.E. (1998), ‘Introduction to research and the psychology of music‘, GIA, Chicago.

Rademacher, J. et al. (2001), ‘Probabilistic mapping and volume measurement of human primary auditory cortex‘, Neuroimage, vol.13, pp. 669-683.

Schneider P. et al. (2002), ‘Morphology of Heschl's gyrus reflects enhanced activation in the auditory cortex of musicians‘, Nat Neurosci 5:688-694.

Schneider P. et al. (2005), ‘Structural and functional asymmetry of lateral Heschl's gyrus reflects pitch perception preference‘, Nature Neuroscience, vol. 8, pp. 1241-1247.

Seither-Preisler, A. et al. (2014), ‘Size and Synchronization of Auditory Cortex Promotes Musical, Literacy, and Attentional Skills in Children‘, Journal of Neuroscience, 34(33), 1093710949.