

Do Absolute Pitch Possessors Have a Field Independent Cognitive Style?

Kathrin B. Schlemmer

Department of Musicology, Martin-Luther-University Halle-Wittenberg, Germany

kathrin.schlemmer@musikwiss.uni-halle.de

ABSTRACT

The factors contributing to the development of absolute pitch (AP) are still not fully understood. It seems to be neither completely inherited nor completely teachable. This study tested the hypothesis, that individual differences in cognitive style influence AP development. Specifically, it investigated whether adult AP possessors can be characterized by a field independent cognitive style while handling visual and musical tasks. Thirty professional musicians performed tests of absolute and relative pitch abilities, a visual and a musical task measuring field independence, and visual tasks measuring intellectual functioning. The absolute pitch test resulted in a continuous distribution of pitch labeling abilities. When the 10 participants with more than 80 % correctly labeled pitches (AP possessors) were compared with the 10 participants with up to 20 % correctly labeled pitches (AP non-possessors), there were no significant group differences in any of the visual tasks. Instead, all participants had above-average scores, compared with the test norm. The motif identification task resulted in small but insignificant group differences in the proposed direction. In the relative pitch test, AP possessors' performance declined when transposed melodies had to be judged. Neither the visual nor the musical task revealed evidence for a higher field independence among AP possessors compared with non-possessors, when both groups consist of adult professional musicians.

I. INTRODUCTION: ABSOLUTE PITCH AND COGNITIVE STYLE

Absolute pitch (AP) is defined as the ability to label individual pitches without using an external reference. Simple as this definition sounds, one might ask, what is so special about AP? One reason for its fascination is the rarity of occurrence, since even among professional musicians, only 5-20 percent are estimated to be AP possessors (Vitouch, 2005). The term absolute is misleading when AP is understood as an absolutely fine sense of pitch: Usually, AP possessors show no better pitch discrimination abilities than AP non-possessors (Sergeant, 1969). Instead, the characteristic of AP possessors is their long-term memory for single pitches (Rakowski & Morawska-Büngeler, 1987).

When AP is characterised as long-term memory for single pitches, it becomes obvious why AP has no practical relevance for professional musicians: Usually, musicians do not need to maintain single pitches in memory. Instead, the daily practice of, for example, instrumental musicians is to integrate their "voice" into a musical context and to perceive (and correct) tiny differences in intonation. The ability they need is therefore "relative" pitch (RP), defined as the ability to relate pitches to one another, and practiced intensively during professional training. While AP possessors usually show no better RP abilities than AP non-possessors with comparable musical training (Sergeant, 1969), Miyazaki (1995) could show that AP possessors sometimes even have specific problems in dealing

with RP tasks. When asked to label musical intervals that consisted of mistuned tones (relative to a normative tuning with $a = 440$ Hz), AP possessors were slower and made more mistakes than AP non-possessors. Supposedly, the AP possessors used an absolute strategy, i.e., they labeled the pitches first and then generated the interval from the two single tones, a strategy that is prone to errors when the single tones can not be named properly due to the mistuning.

A question that has occupied research on AP since its beginnings in the late 19th century, and is still controversially debated, is the origin of AP. On the one hand, geneticists have not yet succeeded in identifying a specific genetic contribution to the development of AP, although research in this area is still work in progress (e.g., Athos et al., 2007). On the other hand, there have been a number of learning studies showing that adults seem to be unable to acquire AP (Meyer, 1899), while children are more successful if they start AP training early enough, i.e., before the age of 5-6 years (Takeuchi & Hulse, 1993). Miyazaki and Ogawa (2006) could show dramatic learning effects with children who started AP training at the age of four. This research is in line with survey data showing that many AP possessors started their private music lessons before the age of seven (Baharloo et al., 2000). These results support the early learning theory of AP development (first mentioned by Copp, 1916), according to which there is a hard age limit for the acquisition of AP. As a reason for such an age limit, Takeuchi and Hulse (1993) proposed that children's perceptual focus typically changes around the age of seven years, when children begin to pay more attention to the context of stimuli. It is important to note that the theory does not assume AP lessons to be necessary, or even typical, for AP development. Rather, the focus lies on early music lessons in general.

Nevertheless, by far not all children with early music lessons develop AP. Even in Miyazaki and Ogawa's (2006) sample of children with specific AP training, the pitch identification rate after six years of training (i.e., at the age of ten) ranged from 60 to 100 percent correctly labeled pitches. This raises the question whether besides effects of different training methods there are also specific dispositions on the learner's side which hinder or support the development of AP. An interesting neuroscientific contribution to this question is the finding that AP possessors show a more pronounced asymmetry of the planum temporale (Keenan et al., 2001), an area in the hearing cortex which is associated with the analysis of auditory material. This asymmetry could be a mediating factor in the acquisition of AP. Research has yet to find out, though, whether the planum temporale asymmetry is inborn (or at least very early acquired) among AP possessors or develops later in life as a consequence of a person's AP acquisition. Another contribution to the question of dispositions is the theory by Chin (2003) who suggested that the development of AP is mediated by individual differences in cognitive style. Specifically, she suggested that an analytical cognitive style together with a tendency towards a

narrow focus of attention support the acquisition of AP among early music learners. She referred to autistic people who have a higher occurrence rate of AP (Rimland & Fein, 1988) and whose cognitive style can be characterised by an extreme concentration on details.

Chin's (2003) description of AP possessors' prevalent cognitive style resembles the cognitive style most often studied, namely the dimension field dependence-independence. This dimension describes the degree of a person's independence from external contexts, be they cognitive or social. On one side of the dimension, an analytical and autonomous thinking style is associated with social independence, while the other end of the dimension is described as a tendency towards global information processing and a more sociable personality. Although there is some empirical evidence for such correlations, the theoretical concept of cognitive styles on the whole has been criticised for the practise of using intelligence tests to measure a dimension (Tiedemann, 1995).

The hypothesis that AP possessors are persons who tend to concentrate on details in a variety of tasks seems intuitively plausible. It is in line, for example, with Miyazaki's (1995) result of AP possessors using an absolute strategie in an RP task and thereby concentrating on single absolute pitches rather than on the context of other presented tones. So far, though, there has been no empirical evidence for a specific cognitive style in the way described by Chin (2003) among non-autistic AP possessors. Costa-Giomi et al. (2001) found better performance in the Hidden Figure Test (a test used to identify field independent individuals) among AP possessors compared with AP non-possessors, but there was also an influence of the age in which music lessons were started. In a study that looked directly at the musical consequences of field dependence-independence, Ellis (1996) found that field independent participants were superior at recognizing the number of instrumental voices in polyphonic and homophonic music.

The aim of the following study is to extend the findings of Costa-Giomi et al. (2001) and Ellis (1996) and to test the hypothesis that AP possessors can be characterized by a more field independent cognitive style than AP non-possessors. For that purpose, AP possessors and non-possessors were asked to complete a variety of both cognitive and music-related tasks. Both participant groups consisted of professional musicians having started their instrumental lessons at a comparable age so that AP-specific differences would not be confounded with more general differences between musicians and non-musicians. More specifically, an AP screening test was used to assess the level of pitch labeling ability of every participant in a more precise way than self-assessment of the participants. A melody comparison task was used to assess participants' RP ability as well as an influence of transposition on RP abilities. It was assumed that transposition would only influence AP non-possessors' RP performance (cf., Miyazaki & Rakowski, 2002). A visual field independence task was used to test the hypothesis in the visual domain, and a music-related field independence task was constructed to test the hypothesis in the musical domain. The music-related field independence task was inspired by Ribke (1979) who constructed tests of musicality for children and suggested to test motif identification in complex music as an equivalent musical task to the visual Gottschaldt figures (Gottschaldt, 1926) used to test field

independence. General intellectual functioning was tested in order to compare it with the field independence data. Finally, a personality test was administered in order to search for the social characteristics of field independence among AP possessors.

II. METHOD

A. Participants

The participant group consisted of 30 professional musicians. Twenty-six of them were orchestral musicians from the professional orchestras of Halle (Staatskapelle Halle) and Leipzig (Orchester des Mitteldeutschen Rundfunks), additionally there was one conductor, one musicologist, one pianist, and one choir-singer. The average age was 40.6 years (range 31 to 51 years). Twenty-two participants were female. The instruments of the orchestra musicians comprised string, woodwind, and brass instruments. On average, participants started music lessons at the age of 6.17 years ($SD = 1.26$ years). Their actual daily amount of practice is on average 3.89 hours per day ($SD = 1.55$ hours/day). Nine participants called themselves AP possessors, while all others called themselves AP non-possessors. However, as self ratings of AP are not sufficiently reliable, all participants took part in the AP screening test.

B. AP Screening Test

In the AP screening test, participants had to label 24 tones with their pitch label (e.g., *a* or *c*#). The tones were presented in an artificial timbre, since several studies suggest that AP possessors label tones more often correctly when they are presented in the timbre of their own instrument (e.g., Schlemmer et al., 2005). Since with only 24 tones a good mixture of instrumental timbres is not possible, triangular waves were used in order to present an artificial timbre. Tones were created on a PC with the Software Cool Edit (Syntrillium). Each tone lasted four seconds including fade-in and fade-out of 500 ms each. Tones were saved individually as wav-files and then combined to the test with the following time scheme: After presentation of each tone there was a silence interval of 10 seconds, followed by five seconds of loud noise bursts. Then there was another silence interval of one second before the next test tone was presented. During the first silence interval (after presentation of the test tone), participants were supposed to write down the pitch label of the tone and to rate how sure they were about their judgment (from 1 = very unsure to 5 = very sure). They were asked to label only the pitch class and to ignore the octave position. The noise bursts were presented after the silent interval in order to help participants forget the previous tone, so that each tone could be judged individually and not in relation to previously heard tones. The whole AP screening test was presented in the described time scheme, without extra breaks, via headphones. It took approximately eight minutes.

C. Melody Comparison Task

In the melody comparison task, participants had to compare 16 melodies which were presented aurally and visually (in musical notation). The task is similar to that used by Miyazaki & Rakowski (2002). The melodies consisted of 7 isochronous

tones. Eight melodies were tonal melodies presented in the key of c major. The remaining eight melodies had no tonal center and could not be classified into a specific key by the existing accidentals (these melodies were labelled atonal). Both the tonal and atonal melodies were presented with two types of differences between aural and visual version. First, there was the factor transposition: Half of the melodies were transposed, i.e., the tonal melodies were notated in c major but presented aurally in f# major. The atonal melodies were transposed by moving each pitch up 6 semitones for the aural presentation. The other half of the melodies were presented untransposed. Second, there was the factor pitch error: In half of the melodies, one of the pitches was moved one semitone up or down, i.e., there was a relative pitch error. The other half of the melodies were presented without such errors. Among the 16 presented melodies, the three factors tonality, transposition and pitch error were combined according to a complete factorial plan.

The participants were asked to attend to relative pitches only and to judge each melody as to whether there had been a wrong note in the aurally presented version. On their answer sheet, participants were asked to rate on a scale from -3 to +3 whether the aural and visual version of each melody were *certainly the same* (+3) or *certainly different* (-3). The steps of +2 and +1 should be used when participants were *rather certain* that the two versions were the same, likewise the steps of -2 and -1 should be used when participants were rather certain that the two versions were different. There was no zero in the rating scale, i.e., participants were forced to decide between same or different. Note that participants' task was only to identify melodies with a wrong note, and not to identify the transposed versions.

All melodies were first created as midi files and then stored as sound files with a piano timbre. They were presented via headphones. Participants heard each aural version just once. After they had marked their answer, there was a short silence of five seconds, then the next melody was presented. Melodies were presented in a fixed order in which tonal/atonal melodies, transposed/untransposed melodies and melodies with/without relative pitch errors were alternated. The melody comparison task took approximately eight minutes.

D. Visual Field Independence Task

In order to measure field independence, participants were given scale 10 of the Leistungs-Prüf-System (LPS, Horn, 1982). LPS is an intelligence test battery, but scale 10 is designed to measure field independence, similar to the Hidden Figures Test. The specific task is to look at 40 complex geometrical figures and to identify one out of five simple geometrical figures (e.g., a square) embedded in the complex figure. Field independent individuals are expected to be better in this task than field dependent ones, because the former concentrate more on specific details and thereby ignore the (distracting) context. Participants had to solve as many items as possible within the three minutes they were given for this task.

E. General Intellectual Functioning

In order to control for general intelligence differences, participants took a number of scales from the LPS. The aim was to compare expected differences in the field independence task with possible differences in other scales. Thus, general

intelligence effects could be differentiated from a specific effect of scale 10. The other scales were: 1 and 2 (general knowledge: word recognition), 3 (reasoning: continuing series of numbers), 5 (finding words), 7-9 (technical abilities: e.g., mental rotation), 11 and 12 (guessing ability: recognizing blurred images and words), and 14 (perceptual speed). All of the scales used here are speed tests, i.e., participants always had to solve as many items as possible within a given amount of time (between two and five minutes, depending on the task).

F. Music-Related Field Independence Task

Since there is no existing music-related field independence task, a specific task was designed and tested in this experiment. The aim of this task was to translate the visual search for figures embedded in complex figures into the auditory domain. Thus, the auditory task was to discover motif fragments in complex polyphonic music, namely in fugues by Bach and Shostakovich. One characteristic of a fugue is that the same theme occurs in all parts, but not at the same time. Hence, it is not easy for an unexperienced listener to concentrate on all parts of the fugue because this means splitting up the attentional focus between three or four parts (in contrast to, e.g., following one melody line in homophonic music).

The musical material for this task consisted of four different fugues. Two fugues by Johann Sebastian Bach were taken from *The Art of Fugue* (BWV 1080), namely Contrapunctus 5 and 12 (Inversus). Two additional fugues were taken from *24 Preludes & Fugues* (op. 87) by Dmitri Shostakovich, namely fugues 4 and 17. The fugues were presented aurally, using commercially available Compact Discs. The Bach fugues were performed by Musica Antiqua Köln (Bach, 1984), while the Shostakovich fugues were performed by Vladimir Ashkenazy (Shostakovich, 1999).

Before listening to the fugues, participants were given a short motif fragment in musical notation. The motif fragments were three to six tones long, i.e., they were considerably shorter than the fugue themes. One motif fragment included the beginning of a fugue theme, the other three motif fragments were taken from the middle of the respective fugue themes. When presented with a motif fragment in musical notation, participants were asked to imagine how the motif fragment would sound. Then they were asked to listen to the first two minutes of the respective fugue. Their task was to lift their hand as often as they could identify the motif fragment in the aurally presented fugue. The experimenter traced the fugue by the score and marked the score whenever a participant had lifted his hand. As in the melody comparison task, participants were asked to attend to the relative pitch scheme of the motif fragment and to ignore the absolute pitches. This procedure was tested with two pilot participants who were not part of the final sample. The pilot participants agreed that the four fugues differed in the task difficulty. The Shostakovich fugue no. 17 was performed in a much faster tempo than the three other fugues, and due to the tempo it was considered to be the most difficult fugue for this task. Other than that, the task was considered to be both meaningful and solvable by the pilot participants.

G. Personality Test

Finally, a personality test was administered in order to search for the social characteristics of field independence among AP

possessors. The Freiburger Persönlichkeits Inventar (FPI, Fahrenberg et al., 2001) was chosen as a screening test for 12 aspects of personality. Among the 12 aspects, the scales cautious-companionable, inhibited-at ease, and introversion-extraversion were considered relevant for possible differences between AP possessors and non-possessors, since these three scales measure aspects of social behavior. If AP possessors can be characterized by a more field independent cognitive style than AP non-possessors, the former should on the social side tend toward the cautious, inhibited, and introverted ends of the respective scales. Participants filled out the whole FPI at the end of the test session, a task of about 10 minutes.

H. Procedure

The experiment was conducted in a quiet lab of the Institute for Music. Participants were tested individually. All musical stimuli were presented via headphones. The experiment lasted about two hours.

III. RESULTS

I. AP Screening Test

Figure 1 displays the results of the AP screening test of all 30 participants. In counting the number of correct responses, semitone errors were tolerated as correct responses as it is the usual practice in AP tests.

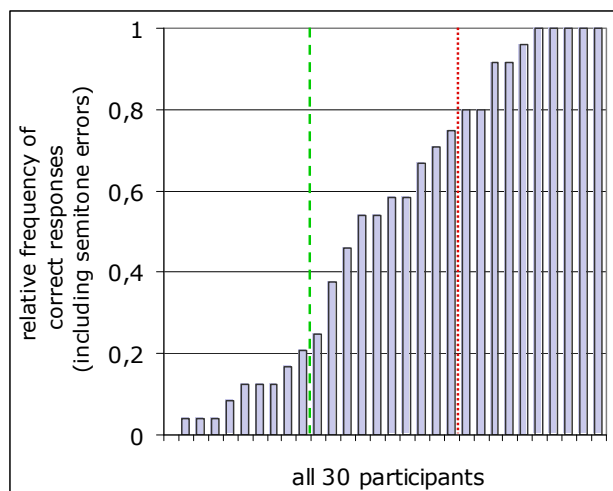


Figure 1. Percentage of correctly labeled pitches (including semitone errors) of all 30 participants. The red dotted line indicates participants with at least 80 % correct responses (AP possessors). The green dashed line indicates participants with up to 20 % correct responses (AP non-possessors, see text for details).

It is difficult to clearly separate AP possessors from AP non-possessors in this sample. If participants with at least 80 % correct responses are regarded as AP possessors, as it is often done in AP research, ten participants of the sample belong to this group. They are separated in figure 1 by a red dotted line. Among the AP non-possessors, the percentage of correct responses ranges from zero to 75 %. For the group comparisons of AP possessors vs. non-possessors, ten participants with up to 20 % correct responses were chosen as AP non-possessors, since their performance can clearly be described as chance

performance. They are marked in figure 1 by a green dashed line. The “middle” group can be described as AP non-possessors with above-chance pitch identification skills. They view themselves as AP non-possessors. In the ratings of how sure they were about their pitch identification performance, AP possessors were in the mean rather sure ($m = 3.7$), while AP non-possessors were very unsure ($m = 1.2$), and the “middle” group was only somewhat more sure ($m = 2.3$). All group comparisons in the following analyses were conducted between the ten AP possessors and the ten AP non-possessors with chance performance in pitch identification. These two groups do not differ in the mean age of first music lessons (AP possessors: 5.8 years, AP non-possessors: 5.9 years), in their mean age (42 vs. 39 years), or in the daily amount of practising (3.6 vs. 4.0 hours).

J. Melody Comparison Task

Figure 2 displays the results of the melody comparison task for AP possessors and AP non-possessors. Participants were given points for their answers according to their rating of certainty. If their answer was correctly positive (e.g., “+2” as an answer to a melody without pitch error), they were given positive points (in this example: +2); if their answer was correctly negative (e.g., “-3” as an answer to a melody with pitch error), they were also given positive points (in this example: +3), and if their answer was incorrect (e.g., “-1” for a melody without pitch error), they were given negative points (in this example: -1). The points were averaged according to the factors *tonality* (tonal-atonal), *transposition* (untransposed-transposed), and *group* (AP possessor vs. non-possessor).

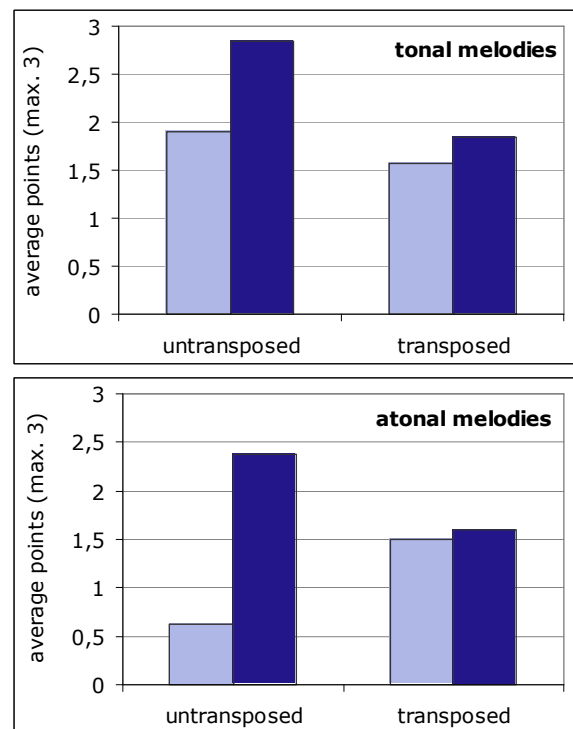


Figure 2. Results of the melody comparison task with tonal (upper part of the figure) and atonal melodies (lower part of the figure) for AP possessors (dark blue) and non-possessors (light blue).

A 3-factor ANOVA of mixed-design with tonality and transposition as within-subjects factors and group as between-subjects factor revealed significant main effects of *tonality* ($F(1,18) = 5.620; p = .029$), of *group* ($F(1,18) = 4.631; p = .045$), but not of *transposition* ($F(1,18) = 1.674; p = .212$). There were significant interactions between *transposition* and *group* ($F(1,18) = 6.032; p = .024$), but not between *tonality* and *group* ($F(1,18) = 0.510; p = .484$), and there was no triple interaction ($F(1,18) = 1.889; p = .186$). As can be seen in Figure 2, AP possessors were on the whole better in this task as AP non-possessors. Their specific advantage is larger, though, for untransposed melodies than for transposed ones, and this applies for tonal as well as atonal melodies.

K. Visual Field Independence Task

The results of the visual field independence task were computed both from participants' raw scores and from the norm-scores. AP possessors obtained a mean raw score of 32.5 (SD = 3.57), while AP non-possessors obtained a mean raw score of 32.4 (SD = 4.30). This difference is not significant, as a t-test revealed ($t(18) = -0.057; p = .955$).

The LPS test uses the T-scale as a norm, with a mean of $m = 50$ and a standard deviation of $SD = 10$. AP possessors obtained a mean norm score of 64.5 (SD = 2.84), while AP non-possessors obtained a mean norm score of 64.0 (SD = 3.94), a difference which is also not significant ($t(18) = -0.325; p = .749$). Both groups show significantly above average performance in this test, as one-sample t-tests against $m = 50$ revealed (AP possessors: $t(9) = 16.155; p < .001$; AP non-possessors: $t(9) = 11.225; p < .001$).

L. General Intellectual Functioning

Figure 3 displays the results of AP possessors and non-possessors in the scales of the LPS used in this experiment. As t-tests revealed, there were no significant group differences in any of the scales. Instead, all 30 participants were in the mean significantly above the norm mean score for all scales but perceptual speed (general knowledge: $t(29) = 6.378; p < .001$; reasoning: $t(29) = 9.906; p < .001$; finding words: $t(29) = 7.906; p < .001$; technical abilities: $t(29) = 20.857; p < .001$; guessing ability: $t(29) = 5.385; p < .001$).

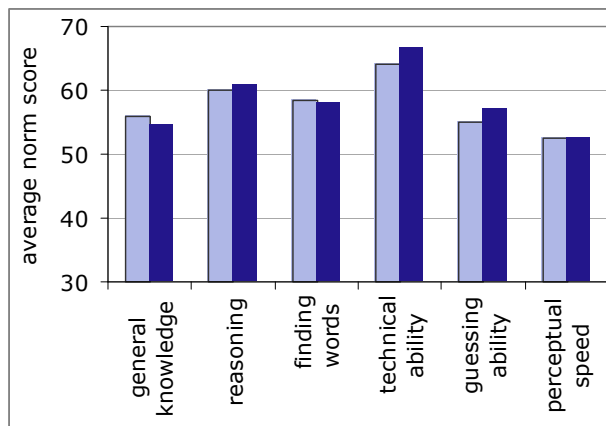


Figure 3. Averaged norm scores of AP possessors (dark blue) and non-possessors (light blue) for the six scales of the LPS.

M. Music-Related Field Independence Task

Figure 4 displays the results for the motif identification task. The relative frequency of “hits” (correct motif identifications) was computed by relating the number of hits to the total number of motifs present in the fugue excerpt that participants listened to. The relative frequency of “false alarms” (incorrect motif identifications) was computed by relating the number of false alarms to the total number of measures presented to the participants. The relative frequency of false alarms was subtracted from the relative frequency of hits in order to obtain the corrected score of each participant. Results of the four fugues were analyzed separately, since there was no prior experience with this task, e.g., regarding the task difficulty of the different fugues.

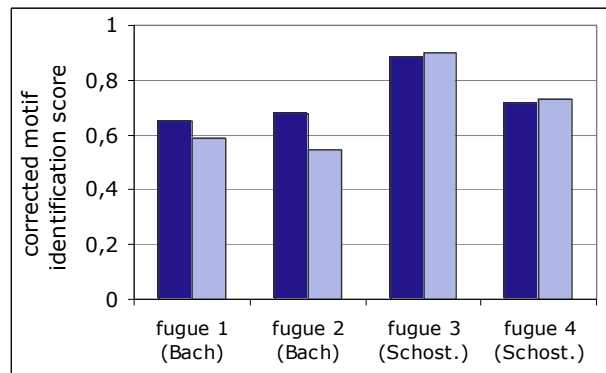


Figure 4. Corrected motif identification scores (relative frequency of hits minus relative frequency of false alarms) for AP possessors (dark blue) and non-possessors (light blue) and for the four fugues.

Independent samples t-tests revealed that in three of the four fugues, the differences between AP possessors and non-possessors were not significant. Only the second fugue resulted in a significant group difference on the 10%-level ($t(18) = -1.763; p = .095$).

N. Personality Test

In the personality screening test FPI, there were no group differences between AP possessors and non-possessors in any of the 12 scales. This means, that AP possessors could not be shown to be more cautious, inhibited, or introverted than AP non-possessors. When the whole participant group of all 30 musicians was included in the analysis, their mean scores did not deviate significantly from the test norm average except for three scales: The sample was significantly more self-controlled ($t(29) = -3.148; p = .004$), more irritable ($t(29) = -2.112; p = .043$), and more compliable ($t(29) = -4.535; p < .001$) than the test norm average. Comparing the results of the visual field independence task and the personality test, there were no correlations between the visual field independence raw scores and the scores on the three socially relevant FPI scales cautiousness, inhibition, and introversion.

IV. DISCUSSION

To test the hypothesis that AP possessors can be characterized by a more field independent cognitive style than AP non-possessors, a sample of musicians completed a series of cognitive and musical tasks. The experiment yielded four main results:

First, the AP screening test revealed that in this sample of professional musicians the distribution of pitch identification performance was not bimodal, but continuous. I.e., besides the AP possessors and those AP non-possessors with very poor pitch identification, there was a group of people regarding themselves as AP non-possessors but showing above-chance pitch identification performance. This is interesting in light of the ongoing debate of whether AP can be regarded as a perceptual trait with a bimodal distribution (Athos et al., 2007) or a continuous ability. The results obtained in this sample support the latter view of AP.

Second, in the visual domain, there were no differences between AP possessors and non-possessors. Specifically, the two groups did not differ in either the visual field independence task or in any of the other cognitive tasks. Instead, the whole sample showed above-average performance in almost all cognitive tasks. This can be explained by the academic background of the sample being above average, for all participants have earned a high school degree and completed their music studies at either a conservatory or university. The test norm, in contrast, was obtained from a sample of the general population. Thus, in the visual domain, the hypothesis of a more field independent cognitive style among AP possessors, compared with non-possessors, could not be confirmed. It is interesting to note, though, that the musician group as a whole showed a pattern of results that could be expected from field independent individuals: On average, their best results were achieved in the scale *technical ability* (including scale 10) of the LPS, while the performance in the scale *guessing ability* was on average about one standard deviation lower. The latter scale requires participants to discern a somewhat blurred picture, asking for global perception instead of a concentration on details and thus was a task in which field independent individuals were not expected to be as good as in scale 10. Thus, field independence is possibly not a characteristic of AP possessors, but more generally of musicians.

Third, on the social side, the hypothesis that AP possessors as field independent individuals should be more cautious, inhibited, or introverted than AP non-possessors could not be confirmed. Furthermore, for the whole participant group, these three scales were not correlated with the visual field independence task. Thus, either the FPI as personality screening instrument is not sensitive enough to measure the specific social characteristics of field independent individuals, or the theoretical description of field independence as a social as well as cognitive style has to be questioned. Further research is needed to characterise the social side of a field independent cognitive style in more detail.

Fourth, in the musical domain, there were specific differences between AP possessors and non-possessors. In the melody comparison task, one of the major results of Miyazaki

& Rakowski (2002) could be replicated: AP possessors outperform AP non-possessors when untransposed melodies are to be compared, but the performance of AP possessors declines rapidly when it comes to transposed melodies. This is in line with statements of several AP possessors of this sample, that they feel disturbed when listening to music that sounds in a key different from notation in the score (e.g., in performances with historical instruments, or with choirs not maintaining a stable key). Thus, both the AP screening test and the melody comparison task describe the AP possessors of this sample as “typical” AP possessors with good pitch identification performance and a tendency to rely on the absolute strategy even when it is not useful, i.e., in an RP task.

In the music-related field independence task, the differences between AP possessors and non-possessors were only very small: Only in the second Bach fugue, a marginally significant difference could be shown. This result can be interpreted in three ways: Either the result of the second fugue is taken as evidence for a tendency towards a field independent listening style in the task. If this perspective is taken, further research with a variety of musical material has to explain why the other fugues did not yield similar results. In the first Shostakovich fugue, for example, the task difficulty might have caused a ceiling effect, with most participants detecting almost all motif fragments. The second interpretation is that this result resembles the result in the visual domain, that there is no field independent cognitive style among adult AP possessors. Although cognitive styles are described as rather stable traits, it is conceivable that they are only important during the learning process of AP, i.e., in childhood. The tendency towards a field independent cognitive style might decline as the AP possessor grows up. This issue can only be resolved by studying field independence among children with and without AP. A third, related, interpretation is that the theory by Chin (2003) might apply for “extreme” samples, such as the comparison of autistic and non-autistic individuals, but not, for example, for two groups of musicians who differ only in the presence or absence of AP. If the third interpretation is correct, AP appears to be a rather specialized skill that is not necessarily connected with something as global as a cognitive style. Rather, the characteristic ways of AP possessors’ information processing seem to be most clearly visible in music-related, or more specifically, pitch-related tasks.

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