CHAPTER FOUR: PREPARATION OF INSTRUMENTS AND SUPPORTIVE DOCUMENTS FOR THE STUDY

4.1. Introduction

This was a case study concerning the acquisition of AP in AT, MS and SEN students at MusH under the instruction of LCK MusET. Both qualitative and quantity data had to be collected, including an AP achievement test, a questionnaire and forms to gather subjects' background information and opinions on AP, instructors' observations, and feedback from instructors, administrators, parents and students. Piano rooms had to be designed and pianos had to be tuned and checked.

4.2. Notice of "AP Acquisition Project"

The study was run as an activity at MusH. In order to inform students and other members of MusH about the "AP Acquisition Project", a notice was issued. The notice indicated that students should come for AP training classes on Sundays from 4th November 2001 to 13th January 2002. Forty piano students would be invited to undergo a pilot study. An AP achievement test would be carried out from 20th December 2001 to 4th February 2002. A questionnaire would need to be filled in after the test. All piano students were advised to join this project. It was made clear that all the data in this project and the personal data in the student's file would be used in the researcher's thesis and treated confidentially. See Appendix IV.1A/B, pp.335-336.

4.3. "Invitation Letter to Participants in AP Acquisition for Pilot Study"

Forty subjects would be asked to join a pilot study (PS) which was held from 12th November to 9th December 2001. The "Invitation Letter to Participants in AP Acquisition for PS" was issued to ask for parent's consent. The reply slip had to be handed back on or before 19th November 2001. Subjects had to undergo an AP test and fill in a questionnaire. See Appendix IV.2A/B, pp.337-340.

4.4. "AP Practice Guidelines of MusH"

In the AP training classes, the "AP Practice Guidelines" was distributed to subjects. In the

guideline, the AP training method was described. This guideline had been used for some years at MusH. Subjects were taught to follow the method to acquire AP. See Appendix I.7, pp.305-307.

4.5. "Guidelines on Piano Tuning and Maintenance of MusH"

In the AP training classes, the "Guidelines on Piano Tuning and Maintenance" was distributed to subjects to call their attention again to the fact that pianos had to be tuned to A440. Pianos should be placed in a room of a constant humidity between 60%±5%. See Appendix I.13, pp.315-316.

4.6. "Guidelines on the Purchase and Operation of Audio Equipment of Compact Discs of MusH"

In AP training classes, the "Guideline on the Purchase and Operation of Audio Equipment and Compact Discs" was distributed to subjects to draw their attention again to listen to music CDs and tapes frequently with proper hi-fi equipment. See Appendix I.14, pp.317.

4.7. "Student Background Information Sheet before Entering MusH for PS"

The "Student Background Information Sheet before Entering MusH for PS" was designed by the researcher to collect information on subjects' musical background and health condition before studying at MusH. The information, supplied by parents or students in admittance interviews, was recorded in subjects' personal files. It was transferred by administrators to this form. Parents and subjects were asked to amend this. It was made clear that the data would be treated confidentially. The information was used to analyse how subjects' music training and health condition before coming to MusH influenced their AP development. See Appendix IV.3A/B, pp.341-342.

4.8. AP Assessment for PS

To test subjects' AP, the "Question Paper of AP Assessment for PS" for piano instructors (see Appendix IV.3A/B, pp.341-342) and the "Answer Sheet of AP Assessment for PS" for students (see Appendix IV.4A/B, pp.343-348) were designed by the researcher.

Piano tones were used as stimuli (e.g. Miller & Clausen, 1997; Pantev et al, 1998; Lenhoff

et al, 2001). There were 50 test tones, like those of Sergeant (1969) and Tervaniemi et al (1993). They were randomly drawn from 88 tones with consecutive tones at least a major third apart (e.g. van Krevelen, 1951; Marvin & Brinkman, 2000). Test tones lasted two seconds each (e.g. Crummer et al, 1994; Hantz et al, 1997). In inter-stimulus intervals, distractions of naming, pointing or writing answers (van Krevelen, 1951), conversations (Petran, 1932) and glissandos (Balzano, 1984) were introduced. Such intervals were long enough to avoid RP (Bachem, 1937).

Subjects were assessed individually (e.g. Pantev et al, 1998; Lenhoff et al, 2001). They took the test before their individual tuitions. They had no chance to listen to tones in class before they took the assessment. Even though they might practise piano before the class, there was a time gap in between. When subjects came into the classroom, they would say hello to instructors, put down their belongings, then seat themselves properly, look at distributed papers, write down names and so forth. These procedures were long enough for non-AP subjects to forget referential tones (e.g. Hall, 1982; Takeuchi & Hulse, 1993). They sat or stood with the back at the piano (e.g. Brady, 1970; Lockhead & Byrd, 1981). Their standing or sitting postures would not allow them to see the keyboard or examiners' movements.

Test tones were played in mezzo-forte, a comfortable hearing level (e.g. Burns and Campbell, 1994; Zatorre et al, 1998). Subjects responded to one test tone after another (e.g. Lenhoff et al, 2001; UCGAPS, 2003). No feedback was given (e.g. Levitin, 1998; Keenan et al, 2001). Judgements had to be immediate (e.g. Baharloo et al, 1998; Marvin & Brinkman, 2000). No answers were accepted after test tones were completed after more than three seconds (Marvin & Brinkman, 2000). Subjects responded by naming note and octave designations (e.g. Miller, 1989; Miller & Clausen, 1997), pointing at keys of the keyboard chart on the answer sheet (Petran, 1932; Wedell, 1934), at the keys of examiners' pianos without sound (Bachem, 1937), at the keys of the second piano without sound (Carroll, 1975; Miyazaki, 1990) or writing note and octave names on answer sheets (e.g.

Tervaniemi et al, 1993; Crummer et al, 1994). If subjects' abilities were too low to write down answers, parents or instructors would do it for them. In the answer sheet, there was the "Name Chart of Letter Names and Sol-fah Names" to remind new, young and SEN subjects on identifying letter or sol-fah names.

Since subjects took the assessments at different time, there was always a chance that they would share answers with each other. Three groups of items were arranged to eliminate this possibility. The items of the second group were Number (No.) 11 to No. 50 and No.1 to 10 of group one. The third group started at No.31 to No.50 and then from No.1 to No.30. Subjects were told that there were several groups of questions. Only one group would be selected randomly. They were told that they should not discuss answers with others. In fact, most subjects were not acquainted with each other. They came for individual classes at different times. They did not even know who had joined the project.

AP achievement may be influenced by attention, fatigue, illness, depression or stress (Sergeant, 1969; Wynn, 1971, 1972 etc.). To control for this, subjects were not permitted to take the test if they were inattentive, hungry, emotionally disturbed, fatigued, anxious or ill. On the other hand, they could take it in several sessions instead of one if they had a short attention span.

Two methods of scoring were utilised. One counted octave errors as mistakes (Klein et al, 1984; Tervaniemi et al, 1993) and the other did not do this (e.g. Wayman et al, 1992; Crummer et al, 1994). The first score was to count answers with right note names and right octave designations for two marks each and with right note names and wrong octave designations for one mark each. The second score was to count answers with right note names regardless of octave errors for two marks each. The passing mark was 60% if octave errors were ignored (e.g. Klein et al, 1984; Miyazaki, 1993) or 50% if the octave errors were counted (Klein et al, 1984).

4.9. "Comment of Student's Response on AP Assessment for PS"

The "Comment of Student's Response on AP Assessment for PS" was designed by the

researcher to record subjects' tonal judgment. After subjects had completed the AP test, instructors evaluated whether they judged tones certainly, immediately or with AP. If subjects were inattentive, moving around, playing games, emotionally unstable and so forth, instructors had to mark it down in the comment column. See Appendix IV.6A/B, pp.355-356.

4.10. 'Questionnaire of Student's Background on Developing AP for PS"

The "Questionnaire of Student's Background on Developing AP for PS" (see Appendix IV.7A/B, pp.357-372) was designed by the researcher to get information from subjects to analyze the phenomena of AP. Most of them related to possible background factors on the development of AP. It was filled in by subjects after the AP assessment, assisted by their parents if needed. Instructors and administrators would explain the details to them before they filled in the questionnaire. If they had difficulties during the course, they were free to ask. It was anonymous. All data were treated confidentially. The main body of the questionnaire appeared after the forwarding letter.

The first section of the questionnaire was concerned with the subject's personal data of age, sex, category of educational needs, age of onset and piano standards. There had been suggestions that the gender, aptitude and age of onset would be influencing factors on the development of AP. Stumpf (1883, 1890, cited in Petran, 1932), Valentiner (1913, cited in Révész, 1953) and Welch (1988) found more men than women having AP. Profita and Bidder (1988) found that more women than men had. But Petran (1932), Sergeant (1969) and Baharloo et al (1998) found no sex difference. Even hereditary theorists (e.g. Gregersen et al, 2001; Stary, 2002) believed that AP depends on music ability. AP is rare in the ordinary population (e.g. Gregersen, 1998; Heaton et al, 1999) and in musicians (e.g. Burns & Campbell, 1994; Dowling, 1999). It is even rarer in the SEN (Hill, 1977) except in the autistic (e.g. Young & Nettbeleck, 1995; Heaton et al, 1998), blind (e.g. Welch, 1988; J.T., 2000), Williams syndrome (Lenhoff et al, 2001) or musical savants (Miller, 1989; Heaton et al, 1998). AP seems independent of intelligence (Heaton et al, 1998).

Shuter-Dyson and Gabriel (1981) queried whether the music aptitude influences the AP development. Concerning the age of onset, AP musicians usually started music training at six years old or younger (e.g. Sacks, 1995; Gregersen et al, 1999, Brown et al, 2003). Some started from seven to nine (e.g. Benguerel & Westdal, 1991; Gregersen et al, 1999). Few started between 10 and 16 (Takeuchi & Hulse, 1991). The older the mean age, the lesser would be the number of AP possessors (Sergeant, 1969). After childhood, it was difficult to learn (Cuddy, 1968). AP would disappear after 12 years of age (Sergeant and Roche, 1973).

The second sub-section was about the tuning of pianos. Tuning affects the AP identification (Vernon, 1942a, b). The judgment would be one semitone higher or lower if AP possessors got used to tunings other than A440 (Petran, 1932; Bachem, 1937; Ward, 1963).

The third section concerned subjects' music partic ipation at and outside MusH. It aimed to clarify whether the music activities at MusH or those outside enabled subjects to develop AP. It was universally accepted that AP may developed from general music learning (e.g. Baharloo et al, 1998, 2000; Keenan et al, 2001), learning music instruments (Sergeant, 1969) or practising the tonal identification (e.g. Eaton & Siegel, 1976; Levitin, 1998, Levitin & Zatorre, 2003).

The fourth to twelfth sections were mainly designed to elicit information on the time and solfège singing in the piano practice, pitch identification, music listening, sight-playing, playing the piano from memory, singing, sight-singing, composing and conducting. Earlier it was shown how the literature indicates that AP was positively influenced by the exposure to music (e.g. Simpson & Huron, 1994; Chang, 2003), tonal-label associations (e.g. Levitin, 1998; Ward, 1999, Levitin & Zatorre, 2003) and pitch identifications (e.g. Miyazaki, 1992; Crozier, 1997).

The thirteenth section was concerned with how AP helped subjects learn to play the piano, identify tones, listen to music, sight-play, play the piano from memory, sing, sight-sing, compose, conduct and learn other knowledge. It is universally accepted that AP helps to

identify tones, chords, keys, produce tones and tune instruments without references (e.g. Marvin & Brinkman, 2000; Macpherson, 2000). Others are arbitrary. Some considered it a disadvantage (e.g. Sundberg, 1991; Krieger, 1997) and some viewed it a valuable endowment (e.g. Brown, 1999; Ward, 1999).

4.11. Piano Rooms

A quiet room without interruption was good enough for the AP tests (e.g. Marvin & Brinkman, 2000; Lenhoff et al, 2001). There were six upright and one grand piano rooms allocated for the test. Refer to Section 1.2, (p.34) for the description of rooms. Before the test, subjects had to move chairs to corners. When subjects sat down, their backs faced the keyboard. These movements acted as distractions to make non-AP subjects forget referential tones.

4.12. Pianos

The piano was commonly used to produce test tones in AP tests (e.g. Pantev et al, 1998; Lenhoff et al, 2001). Six Yamaha C108 upright and one Yamaha C2 grand pianos were allocated for the test. One upright piano was furnished in each small room. The grand piano was placed in the large room. They were brought in brand-new form three to six years before the study and were maintained in good condition. They were tuned and inspected once between 6th November to 11th November 2001 to ensure that they were in tune and in proper condition.

4.13. "Comment of AP Acquisition Project for PS"

The "Comment of AP Acquisition Project for PS" was designed by the researcher to gather opinions about the "AP Acquisition Project" from instructors, administrators, parents and subjects. All the activities were listed in the form. Open questions were used to obtain this information. See Appendix IV.8A/B, pp.373-376.

4.14. Pilot Study

The PS was planned to examine: a) how instructors conducted the test, including the ways of producing test tones and intervening noises, and writing answers for students; b) how

subjects took the test including the ways they sat, responded and wrote answers; c) how parents helped subjects write the answers; d) the organization and the administration of the invitation letter, guidelines, AP assessment, questionnaire and comments; and e) the suitability of the piano rooms and pianos.

4.14.1. Sampling

Forty students were invited for the PS. At least one student was randomly selected from each educational category, age group and piano grade. Twenty-nine students promised to be subjects, including 14 male and 15 female. There was at least one subject in each category except the SD. See Table 4.14.1.1.

Table 4.14.1.1: Number of Male and Female AT, MS and SEN Subjects for PS

Educational Category	Number of Subjects		
	Male	Female	Total
AT	1	1	2
MS	8	12	20
Autistic	1	0	1
EBD	1	1	2
LD	2	0	2
SID	0	1	1
Moderate HI	1	0	1
Overall Totals	14	15	29

Subjects were from three to 25 years old, covering nearly all the age ranges. See Table 4.14.1.2.

Table 4.14.1.2: Age Range of AT, MS and SEN Subjects for PS

Educational Category	Number of Subjects in Each Age														Total
	3	4	5	6	7	8	9	10	11	12	13	14	15	25	
AT	0	0	0	0	0	0	0	0	0	1	1	0	0	0	2
MS	1	1	1	1	1	5	3	2	2	0	1	1	1	0	20
Autistic	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1
EBD	1	0	1	0	0	0	0	0	0	0	0	0	0	0	2
LD	0	0	0	0	1	0	0	1	0	0	0	0	0	0	1
SID	0	0	0	0	1	0	0	0	0	0	0	0	0	0	1
Moderate HI	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Overall Totals	2	1	2	1	3	5	3	3	3	1	2	1	1	1	29

There was at least one MS subject in each grade. There was only one AT which was in grade six. There was no SEN subjects in grades 3, 5, 6, 7, 8 and in diploma. See Table 4.14.1.3.

Table 4.14.1.3: Number of AT, MS and SEN Subjects at Each Grade for PS

Educational Category	Number of Subjects in Each Piano Grade										Total
	Preparatory	1	2	3	4	5	6	7	8	Diploma	
AT	0	0	0	0	0	0	1	0	0	1	2
MS	2	1	4	3	1	2	1	1	2	3	20
Autistic	0	0	0	0	1	0	0	0	0	0	1
EBD	1	1	0	0	0	0	0	0	0	0	2
LD	0	0	1	0	1	0	0	0	0	0	2
SID	0	0	1	0	0	0	0	0	0	0	1
Moderate HI	0	0	0	0	1	0	0	0	0	0	1
Overall Totals	3	2	6	3	3	2	1	1	2	4	29

4.14.2. Administration

The process of the PS is described as follows.

On 9th October 2001, instructors and administrators were called for an introductory meeting. The meeting, conducted by the researcher, was held at 6:00p.m. to 8:30p.m. on 20th October. All the notice, guidelines, invitation letters, assessment papers, information sheets, questionnaires and forms for comment were distributed and discussed. The AP training and assessment procedures were practised by instructors and administrators.

The notice of the "AP Acquisition Project" was distributed to all piano students and parents from 22nd to 28th October 2001 when they came back for classes. Any subjects absent that week would be notified through telephone calls. The notice would be distributed next time when they came back for classes. They were encouraged to join the AP classes on Sundays from 4th November 2001 to 13th January 2002. The students of the preparatory and first grades came from 5:00p.m. to 6:00p.m., and those from grades two or higher came from 6:00p.m. to 7:00p.m.

The AP classes which were conducted by the researcher started on 4th November 2001. In the classes, the guidelines, information sheets and forms for comment of the study were

distributed and introduced. The AP practice and assessment were tried. Students were told to tune pianos by the contracted piano tuner regularly, maintain pianos in good condition, sing absolute solfège in all music practices, practise the AP identification and come for the AP classes on Sundays until 13th January 2002.

All the pianos at MusH were tuned and checked by the contracted piano tuner from 6th to 11th November 2001. On 11th November, the AP classes were held.

The PS started on 12th November 2001 when the 40 subjects for the PS were notified by administrators. The invitation letter was distributed to them from 12th to 18th November. The aims, content and procedure of the study were explained. They were asked to sign back the reply slip on or before 19th November. When they handed back reply letters with a positive response, instructors would follow them up. Instructors would tell them again about the methods of practising the piano, singing solfège, practising tonal identification, maintaining pianos in good condition, arranging regular piano tuning and listening to tones in music listening. The guidelines were distributed to them. Instructors practised AP with them in class. After they had prepared well, they could take the test any time on or before 9th December.

On 18th and 25th November 2001, the AP classes were run.

From 27th November to 9th December 2001, subjects took the AP test. After the test, instructors explained to them how to fill in the questionnaire which should be handed back on or before 9th December. On 2nd December, the AP classes were run.

The 4th to 9th December 2001 was the last week for the PS. The AP test and questionnaire had to be completed. Meetings were arranged for the researcher to meet subjects and parents to gather comments for improving the main experiment. On 9th December, AP classes were run. All tests, questionnaires and comment forms had to be completed by this day.

From 11th to 16th December 2001, the researcher collected all the assessment papers, questionnaires and forms. Meetings were arranged for the researcher to meet instructors

and administrators to ask for their comment concerning the PS. From 17th to 21st December, the researcher revised all the information sheets, invitation letters, assessment papers, questionnaires and forms for comment. They would be ready for the Introductory Meeting with instructors and administrators on 22nd December.

4.15. Final Versions of Instruments and Supportive Documents for Main Study

After the PS, the researcher collected all the materials from administrators. The data were analyzed. The invitation letter, information sheet, AP assessment, questionnaire and forms for comment were revised.

4.15.1. "Invitation Letter to Participants in the AP Acquisition Project"

No comment was received. In the final invitation letter, the material of the PS was deleted and replaced by that of the main experiment. See Appendix V.1A/B, pp.377-380.

4.15.2. AP Assessment for New Students

All subjects, when they came to MusH, had to take a simple AP test. The "Question Paper of AP Assessment for New Students" (see Appendix V.2A/B, pp. 381-385) for interviewers and the "Answer Sheet of AP Assessment for New Students" (see Appendix V.3A/B, pp.386-387) for students were designed. The testing method was similar to that of the AP test in the PS. It comprised ten randomly selected items from the middle register (e.g. Heller & Auerbach, 1972; Siegel, 1974) which was the easiest to identify among all (Rakowski, 1978; Rakowski & Morawska-Bungeler, 1987). No octave designation was needed. One right answer carried ten marks, with 60 the passing and 100 the full mark.

4.15.3. AP Assessment

The AP assessment was revised according to comment. The researcher did not assess any students and instructors did not assess students of their own to ensure validity. In order to disclose the characteristics of AP thoroughly, all 88 piano tones were employed (Bachem, 1937; van Krevelen, 1951). Consecutive tones were at least a major tenth (i.e. an octave and a major third) apart instead of a minor third apart to avoid RP further (Miyazaki, 1990; Takeuchi & Hulse, 1993; Levitin, 1998). Subjects could give correct answers after test

tones were presented for one second in the PS. Test tones were thus shortened to one second (e.g. Miller & Clausen, 1997; Baharloo et al, 1998; Marvin & Brinkman, 2000; UCGAPS, 2003). Examiners sometimes played test tones loudly when subjects were inattentive or moving around. Playing test tones in forte happened sometimes. Such variation in dynamics exerted no pitch fluctuation (Ward, 1999). Test tones were allowed to vary from mezzo-forte to forte (Heller and Auerbach, 1972; Balzano, 1984; Burns & Campbell, 1994; Zatorre et al, 1998). If subjects were out of control, the test would cease. The inter-stimulus interval was regulated at least 30 seconds. If a longer time was needed to write down answers, the interval could be prolonged until it was completed (van Krevelen, 1951). This was long enough to avoid RP (Bachem, 1954). Examiners were given stop-watches to count the time.

All subjects responded by giving sol-fah and octave names in the PS. If subjects gave answers by pointing at piano keys or at the keys in the keyboard diagrams of answer sheets, they were asked to give letter names or sol-fah names with octave indications afterwards. If they chose to write answers, they had to name answers first. It was because they or their parents had to write answers. Examiners had to check whether the answers were the ones they intended to give. Whenever they wrote answers, examiners would check whether the answers were in right blanks or boxes. It was found in the PS that careless subjects skipped the last blanks of some rows. Sometimes if they failed to identify tones, they did not leave blanks accordingly. Examiners should call out item numbers clearly too.

After each written answer, subjects had to say something like: "It is done. I am ready for the next one, please!" The instructor might respond by saying something like: "Fine! The next one is….." and so on. The dialogue between subjects and examiners served as a distraction (Petran, 1932). Examiners did not sweep keys across the keyboard for intervention. Glissandos might act as references if the tones were swept clearly one after another (Ward, 1999).

Since the method of the assessment changed, the "Question Paper of AP Assessment"

(Appendix V.4A/B, pp.390-396) and the "Answer Sheet of AP Assessment" (Appendix V.5A/B, pp.397-422) were revised. The second objective for the PS was deleted. The date for the test, 20th December 2001 to 4th February 2002 was inserted.

4.15.4. "Comment of Student's Response on AP Assessment"

The "Comment of Student's Response on AP Assessment" had no alternation. See Appendix V.6A/B, pp.403-404.

4.15.5. "Student Background Information Sheet before Entering MusH"

Records of long-term diseases and chromesthesia were added into the "Student Background Information Sheet before Entering MusH". Others remained unchanged. See Appendix V.7A/B, pp.405-406.

4.15.6. "Questionnaire of Student's Bac kground on Developing AP"

The structure and administration of the "Questionnaire of Student's Background on Developing AP" were amended. See Appendix V.8A/B, pp. 407-418.

Instead of being filled in by students and parents, the questionnaire was completed by examiners under interviews. The researcher would not interview any subjects and examiners could not interview students of their own to ensure validity. From the 29 subjects in the PS, 21(72.4%) subjects and parents needed close guidance from examiners. The other eight questionnaires completed by students and parents themselves had three to eight items missing. Some items might have answers of "No". It was suggested adding in the instruction of "Go to Item ....." to give interviewers a precise direction. The definitions of AP and RP were deleted.

In Section I of the finalized questionnaire, the subject's name, language background, and the information on tinnitus and chromesthesia were added. Meyer (1970, cited in Petran, 1932) insisted that AP could be developed better in primitive people, but his viewpoint was objected to by Stumpf (1911, cited in Petran, 1932). Gregersen, et al (1999) speculated a higher prevalence of AP genes in Asian populations since more AP persons were found in Japan. Deutsch (1999) proposed that speakers of tonal languages were likely to develop AP

than those of phonetic languages. However, this has been contested by Ladd (1999), Lawton (1999), Hall (1999) and Zatorre (2003). Subjects in this study spoke Cantonese or English. Cantonese is tonal and English is phonetic. Stanaway et al (1970) found no correlation between AP and tinnitus. But Costall (1985) reported AP musicians using tinnitus as anchors. Some AP possessors had chromesthesia (Block, 1983; Profita & Bidder, 1988). Some AP persons were reported to anchor tones to colours (Petran, 1932; Costall 1985). The language background, tinnitus and chromesthesia were thus added as variables to clarify their relationships to AP. The item of the "Down's syndrome" was cancelled and fell into the MR category. The "hyperactive" group was cancelled and grouped into EBD. The "mild" and "profound HI" groups were cancelled without available subjects.

In Section II, Items 2, 3, 4 and 6 were cancelled. The essence of this part was to know whether subjects' pianos were in tune or not. It was unrealistic to ask the piano tuner to check all the subjects' pianos. One possible solution was to ask the subjects to compare the tones of their pianos to those of the grand piano at MusH. Thus, only "your piano in tune or not" and "if not, explain" were asked.

Section III was the "Pitch Identification" which was moved from Section V of the pilot questionnaire. The time of the AP identification practice was asked to find out whether a longer practice time would lead to a better AP achievement (Brady, 1970; Eaton & Siegel, 1976 etc.). In item 4, the choices of answers were indicated in minutes specifically. Items 6 and 7 were added in to find out how AP subjects processed AP and identified note and octave names. There were controversies on these issues. Tones might be perceived and processed through tonal qualities (e.g. Miyazaki, 1988; Semal & Demany, 1990), chromesthesia (Petran, 1932; Costall, 1985), internal fixed scales (Brady, 1970; Corliss, 1973), an internal referential tonal standard (Wynn, 1971), more than one internal standard (e.g. Costall, 1985, 1987; Levitin, 1994), verbal codes (e.g. Takeuchi & Hulse, 1993; Keenan et al, 2001; Ohnishi & Matsuda, 2001), associations to keyboards with hand movements (Petran, 1932; Miyazaki, 1990), larynx positions (Petran, 1932), letters or

words (Siegel, 1974), compositions (Chang, 2002), ear ringing sounds (Costall, 1985), and/or staves (Zatorre & Beckett, 1989). AP possessors might process AP with one sensory code (e.g. Marin & Perry, 1999; Keenan et al, 2001; Ohnishi & Matsuda, 2001) or with multiple codes (Zatorre & Beckett, 1989; Zatorre et al, 1998). AP possessors identified note names before octave designations as a two-way process (Miyazaki, 1989; Takeuchi & Hulse, 1993). Different processing strategies were included in items to find out how AP possessors perceived and processed AP.

Section IV was the "General Music Activities Participation" which was moved from Section III of the pilot questionnaire. Few more columns were supplemented, i.e. sight-playing, sight-singing, identifying notes and learning music theory.

The major parts of sections V to XII remained unchanged except cancelling "the frequency of pitch strategies". "Usually" was added in to ask subjects "what strategy did they usually use?" The frequency of using AP in music activities was counted from the total numbers of activities using AP.

The order of music activities in Sections VI to XII was re-arranged. The "Music Theory" was a new item inserted. The three questions were the same. Item 1 was unchanged. Item 2 was new to find out whether subjects sang or thought of tones in music activities. Item 2 in the pilot questionnaire was moved to item 3 and "usually" was added. Item 3 in the pilot questionnaire was cancelled. Item 4 of Section VI, i.e. to "name the longest piece of music which subjects played from memory" was moved from the last part of Item V of Section XIII of the pilot questionnaire. It made the questionnaire look unified. In the number of trials, the item was changed to multiple choice questions. The time for memorizing a piece was omitted.

In Section XIV, "The Genesis of AP" was inserted. The aetiology of AP has been an area of some dispute. It may come from genes (e.g. Baharloo et al, 1998, 2000; Gregersen, 2001; Stary, 2002) or nurture (e.g. Miyazaki, 1990, 1992; Takeuchi & Hulse, 1991, 1993; Crozier, 1997). The questions concerned the AP familial congregation, the time to reveal AP and

influencing factors. These factors were the music activities participation, tonal identification training, tonal-verbal association, in-tuned instruments, inheritance, tinnitus and chromesthesia.

The music activities of Section XV were regrouped, following the sequence of Sections III to XIII. The item of "learning music theory" was inserted. The "value outside music" was cancelled since it was beyond the scope of this research. Some wordings of choices of answers were altered for clarity.

4.15.7. Piano

Subjects preferred the grand to upright pianos because grand piano tones were more distinctive and accurate. Therefore, only the grand piano was used in the AP test.

4.15.8. Grand Piano Room

Because the grand piano was the only instrument used, the grand piano room was the only place to take the test. The room was re-staged. The grand piano was fixed at the left corner of the room. Opposite to the grand piano was another upright piano. They were facing to each other with seven feet apart. In front of the upright piano were placed a table and two chairs.

There were three possible places for subjects to take the test: (a) If subjects pointed at keys and wrote answers themselves, they sat at the table, facing the upright piano with their back against the grand piano. They pointed at keys with one hand and wrote answers with another. (b) If subjects pointed at the keys and parents helped to write answers, they stood in front of and faced the upright piano. Parents sat at either side of the table. (c) If subjects named answers or pointed at the keyboard diagram on the answer sheet and parents helped them write answers, they sat at the table with their backs against the grand piano. Parents sat at either side of the table.

4.15.9. "Comment of the AP Acquisition Project"

No amendment was made on the "Comment of the AP Acquisition Project". See Appendix V.9A/B, pp.429-430.

4.16. Coda

As the assessment papers, questionnaires, forms for observation and for collecting the personal data and comment, the piano room and the grand piano were ready, the main experiment was going to be conducted from 26th December 2001 to 4th February 2002.