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RELIABILITY OF TRUMPET PLAYERS' JUDGMENTS DURING INSTRUMENT BLIND-TESTS

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Abstract: The quality of trumpets has been tested during a trumpet research project. 55 Players from three countries (Austria, Finland, USA) have performed 252 playing tests with specific test instruments. 19 players are professional; others have been semi-professional players or advanced trumpet students.
Musicians could not see the instruments in the dark room, and they expected to evaluate different setups of trumpets. In fact, 32 judgments have been repetitions of previous tests, whereby nineteen test repetitions have been done by different players with various trumpet combinations.
The test consisted of about 40 verbal assessments of the acoustic properties and playability parameters. Aim of the study was to examine which characteristics of instruments can be considered to be reliable.
Results show a very good and highly significant correlation of the overall ratings of the instruments between test repetitions, but unsatisfactory or very poor correlations in many(?) detailed questions. Reliable judgments could be found on questions about the brilliance and power of the sound, "how good notes can be lipped up and down" and "how fast the notes start". Very poor reliability, however, was found in the ratings of parameters that musicians believe they can judge, for instance, general response, resistance and tone colors.

Keywords: music acoustics, brass, trumpet, playability, reliability of instrument judgments

Photo 1 Trumpets, Mouthpieces, Leadpipes and Bells have been stored in a "DEG top secret case"

INTRODUCTION

Acoustic research studies on brass instruments have revealed knowledge on many aspects about the playing characteristics of trumpets, trombones and all other brass instruments. [1,2] Today, there is software available that can measure and calculate the intonation and some other parameters of such instruments. But, computers can only work when the parameters can be quantified. [3] Musicians usually play their instruments without considering all the underlying physics (thank goodness!), they master complicated tasks and learn to reproduce an enormous amount of empirical data or create artistic ideas.

The first aim of the trumpet research project is to define which playability parameters of brass instruments can be generalized and can be shared by the brass community. Thomas Moore of the ITG (International Trumpet Guild) described the project as "the arduous task of trying to quantify the vocabulary of trumpeters … that has been ignored for far too long". Currently we have no way to measure the "feel" of a horn, and therefore the statements of sellers about playability, response and sound quality are almost meaningless.

Empirical research in this field is rare. Concerning the performance of blind tests, the author thanks Klaus Wogram and Dale Olson for sharing experiences. Because of the heavy and critical influence of psychological expectations of brand marks, making, and other visual clues, all playing tests have been made as blind performing tests. Each test has been done in a oral form in a dark room with specific test instruments (piston valve and rotary trumpets) …

TRP PROJECT SCHEDULE

Since many years, the Brass-Instrument-Analysis-System (BIAS) has been developed at the Institute for Musical Acoustics (IWK). Meanwhile many international instrument makers, universities, and music instrument museums take use of the tool for studying and improving brass instruments. (www.bias.at.) In 2002, the TRP Project was initiated to find new fundamental knowledge requested by makers, researcher and players of brass instruments.

It started by an international call for receiving a selection of specific test instruments for blind performance tests and preliminary studies. Instruments from Europe, America and Asia have been donated for this study. Since most instruments are rather prototype instruments or the brand names and models are anonymous. This paper presents the first pictures of these instruments (see Photo 1), since no player should know anything about the types and amounts of instruments during the blind tests.

In 2003 the project continued with a specific lecture and introduction to the professional trumpet students at the Vienna Music University. After discussions of the test procedure, over 80 blind test sessions were performed with advanced students and professional players. Because of tradition, all tests have been made with rotary trumpets. The first results have been presented at the international Music Acoustic Conference in Stockholm, Sweden. [4]

In September 2003 followed lecture and blind performance tests at the Sibelius Academy in Helsinki, Finland . Nine professional players from the best finnish orchestra took part in over 40 blind testssessions. In december 2003 it continued with further blind test sessions in Vienna. Finally, in February 2004 a project tour through midwest USA led to four "schools of music". During four weeks many lectures on brass acoustics and blind test sessions with students and professional players have been collected.

Each single blind test had a duration of ten to 60 minutes and about 40 questions had to be answered. The questionaire was completed by the project leader and the answers have been stored in a computer database on the laptop. The first test usually took longer as following tests. Repetitions of the setup have been made randomly. If test players made more than 3 tests, one test has been repeated – without the knowledge of the player. Instruction has been, that there is always a new setup to test. If the instruments feel similar in the hand, there could be changes within the instrument.

This paper deals with the analysis of the reliability of the answers. The next step of this research project will be to find correlating physical parameters which can be used in further calculations and measurements. These parameters would help to develop a measuring and analysis module for standard input impedance software like BIAS. If preferences of these physical parameters of different player types are revealed (beginner versus professional player, classical or jazz player, etc.) modern computerized optimization like BIOS would allow the improvement of real instruments and to create tools for developing future instruments.

TEST PLAYERS AND TEST INSTRUMENTS

1. Musicians

The sample of players consists of 55 musicians from three countries: Austria (*n=13*), Finland (*n*=9), and USA (*n=33).*

All musicians from Finland are professional players. Participants in the USA and Austria are professional as

well as semi-professional players or advanced trumpet students. There are no beginners in the sample (see Figure 1). Therefore, the Finnish musicians have also longer playing experience than the players from the USA and Austria (Kruskal-Wallis Test, $\chi^2 = 20.74$, df = 2, $p < .001$; see Table 1).

Most players in the sample are male (see Figure 2), and just two musicians play only Pop or Jazz (see Figure 3). Especially US-students are allrounder concerning the literature.

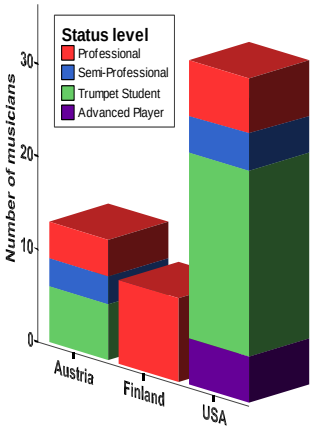

Fig. 1 Status level of musicians

	Austria	Finland	USA
Median	13	40	11
Modus	13	40	9
Minimum	8	27	4
Maximum	30	44	40
Percentile 75 – 25	16 - 13	42.5 – 32.5	14.5 – 8.5

Table 1: Musicians experience in Years

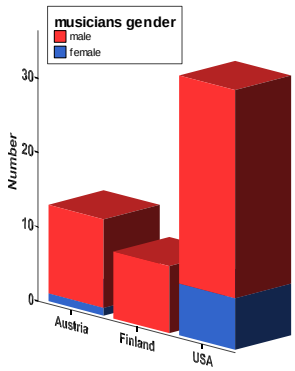

Fig. 2 Gender

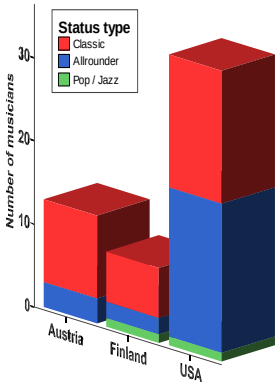

Fig. 3 Status type

2. Trumpets

All in all 252 playing tests have been performed. Trumpets 14, 19 and 21 are the main perinet (piston valve) trumpets used. Instruments 24, 27 and 38 have been the main rotary trumpets in use. Trumpets 21 and 27 were used most frequently with different lead pipe, mouthpiece and bell, trumpets 12, 15, 20, 40, 43, 44 only once or twice (see Figure 4).

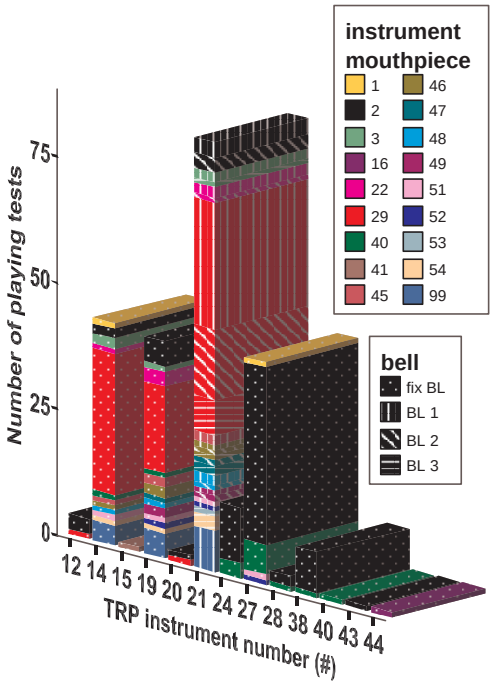

Fig. 4 Number of playing tests with trumpet combinations

From 252 playing tests, 32 tests have been repetitions of the same player with the same instrument. These 32 tests were repetitions in which a musician played a particular trumpet combination the second time, whereby time spans

between the playing tests varied between a few hours and some months, and in further 5 playing tests the musicians played a particular combination also a third time.

Each player has been asked, if he could and would use one of the two provided mouthpieces: Bach 1 ½ C for piston trumpets {mouthpiece #29} or Breslmayr G2 for rotary trumpets {mouthpiece #2}. Figure 5 shows test repetitions with mouthpiece #2 in black and repetitions with mouthpiece #29 in red. Trumpeters could also prefer their own mouthpiece, if they did not feel comfortable with the default mouthpiece.

Figure 5 shows how often each trumpet combination was used in the second playing tests.

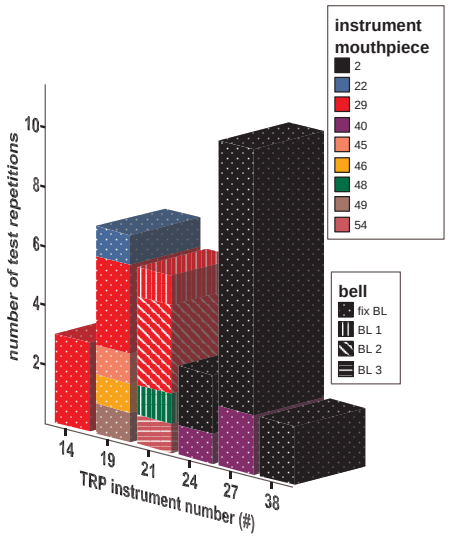

Fig. 5 Number of test repetitions with trumpet combinations

METHOD

Statistical Analyses

As measure for reliability of instrument judgments between the two test repetitions Kendall's Tau-b (τ) was used. This is a coefficient of association for ordinal-level variables based on the number of concordances and discordances in paired observations. Possible values lie between -1 and +1. It reaches +1 in square tables when all entries are on the main diagonal, that is if there are only concordant pairs; 0 means statistical independence, that is there is no relationship between the two judgments. Additionally, differences in judgments between playing tests have been analysed using Wilcoxon's Matched Pairs Signed Rank Test. This nonparametric test makes use of the direction and magnitude of the differences within pairs of variables.

Furthermore, a factor analysis (principal components analysis) for the reliable questions was used to validate the questionnaire by investigating the factor structure. Principal components analysis is aimed to find so-called latent (i.e. not directly observable) dimensions (= factors) which can explain correlations between a set of empirically observable variables. Therefore, those variables which show high intercorrelations build one common factor, whereby different factors are presumed to be independent.

Technically speaking, *factors* represent the *common* variance of variables, excluding unique variance. The factor loadings represent the correlations of the variables with the factors, the squared factor loading is the percent of variance in that variable explained by the factor. Each variable should load on only one of the factors, and do not cross-load on many factors, i.e. the constituent items of a dimension should load on the respective factor. The eigenvalue for a given factor measures the variance in all the variables which is accounted for by that factor. If a factor has a low eigenvalue, then it is contributing little to the explanation of variances in the variables and may be ignored as redundant with more important factors. A common rule of thumb for dropping the least important factors from the analysis is the Kaiser criterion, which drops all components with eigenvalues under 1.0.
Statistical analyses were performed using the Statistical Package for the Social Sciences (SPSS), Version 12.0.

RESULTS

1. Reliability

To analyze reliability of trumpet judgments of the 32 repeated playing tests for each trumpet combination only one musician was randomly selected, such that each particular combination is represented only once in the sample. The remaining sample size is 19 test repetitions. Figure 6 shows the results of the statistical analyses of reliability of trumpet judgments.

The ***overall instrument classification*** shows a very good and highly significant correlation between test repetitions ($\tau = 0.74$, $p = .001$). The musicians should classify in 5 categories if the trumpet is a "profi-instrument", "semi-profi instrument", "conservatory instrument", "advanced players" or "beginner instrument". Therefore, the musicians judged this quality of the trumpets on the whole consistently.

There is no "best trumpet"

Players personal preference shows a reliability in the middle range just over significance level ($\tau = 0.36$, $p = .08$). The quality differences of the test instruments have been not so huge, that there is one trumpet preferred by all players. The Comparison of Trumpets

regarding Players Personal Preference (musicians playing the respective combination the first time) show statistically: The difference in judgments of different trumpet combinations is not significant (Kruskal-Wallis Test, χ^2=12.47; df=14, p=.57; see also mean ranks in Table 2).
Trumpet #38 has been judged worst (this is in fact a very old instrument, that already was sorted out by the Vienna trumpet professors). Very interesting is the fact that trumpet #19 is not as polarizing as #14, which can be seen in the histograms for trumpets #14 and #19.

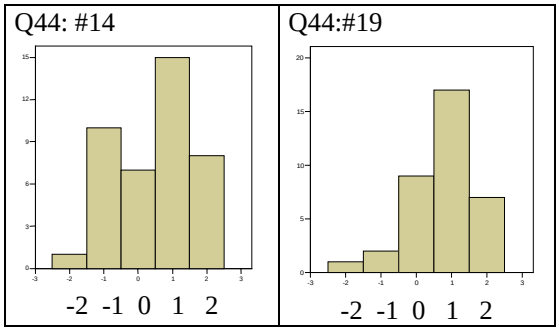

Figure 7 shows the Range (Whiskers), Median (bold lines), and 25th and 75th Percentile (red bars) for Question 44 (Players Personal Preference).

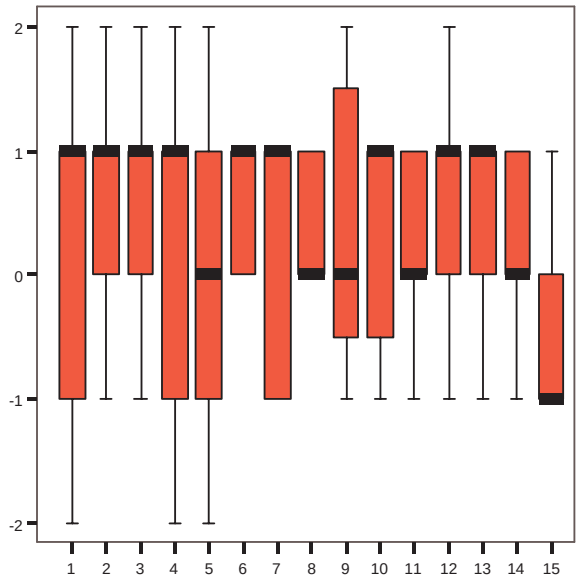

Fig. 6 Players personal preferences about Trumpet combinations (Results of Q44)

1	#14		
2	#19		
3	#21BL1LP1	Rotary TRP	
4	#21BL1LP2		
5	#21BL1LP3	11	#24
6	#21BL1LP4	12	#27LP1
7	#21BL2LP1	13	#27LP2
8	#21BL2LP3	14	#27LP3
9	#21BL3LP2	15	#38
10	#21BL3LP4		

Table 2: Mean ranks for Q44

Trumpet combination	N	Mean Rank
#14	41	104,84
#19	36	119,72
#21BL1LP1	14	101,46
#21BL1LP2	14	97,79
#21BL1LP3	10	85,60
#21BL1LP4	9	113,00
#21BL2LP1	8	94,25
#21BL2LP3	11	98,68
#21BL3LP2	7	100,79
#21BL3LP4	7	94,43
#24	9	85,78
#27LP1	11	110,59
#27LP2	9	101,06
#27LP3	9	81,06
#38	7	56,93
Gesamt	202	

Regarding detailed questions about the trumpet playing characteristics, the following results were found:

Flexibility vs. tone center**:* All questions regarding *how good can be* ***lipped up and down show significant reliability measures around 0.50. Therefore, this quality can be judged sufficiently consistent irrespective of valve position and register. Further studies and analysis of the test instruments will focus on this parameter.

Regarding the *sound* reliable judgments could be found about the ***brilliance*** and ***power of the sound***, and the ***dynamic range.*** Very poor reliability, however, was found for the parameters ***tone colors*** *(dark vs. bright)* and ***tone quality at crescendo***.

The playability characteristic ***response***, was of special interest in the present study. Parameters ***start feedback*** *of the tone* as well as ***repetition*** seem to be qualities which can be judged consistently. However, the parameter *general response* showed very low correlation coefficients between test repetitions, and judgments were also significantly more severe at the second time point. Furthermore, the parameter ***resistance*** *and* ***air consumption*** showed very poor reliability. This fact is very surprising for players, since all players talk about resistance, but there is no general definition of this characteristic. And it is not reliable!

Similar astonishing is the unreliable statements on the ***personal sound preference***. Of course, this depends on the demands of the music, but also on the instruments the trumpeter played just before. During the tests, players speak very certain if they like the sound or not.

Reliability of the judgments in TRP blind-performing tests

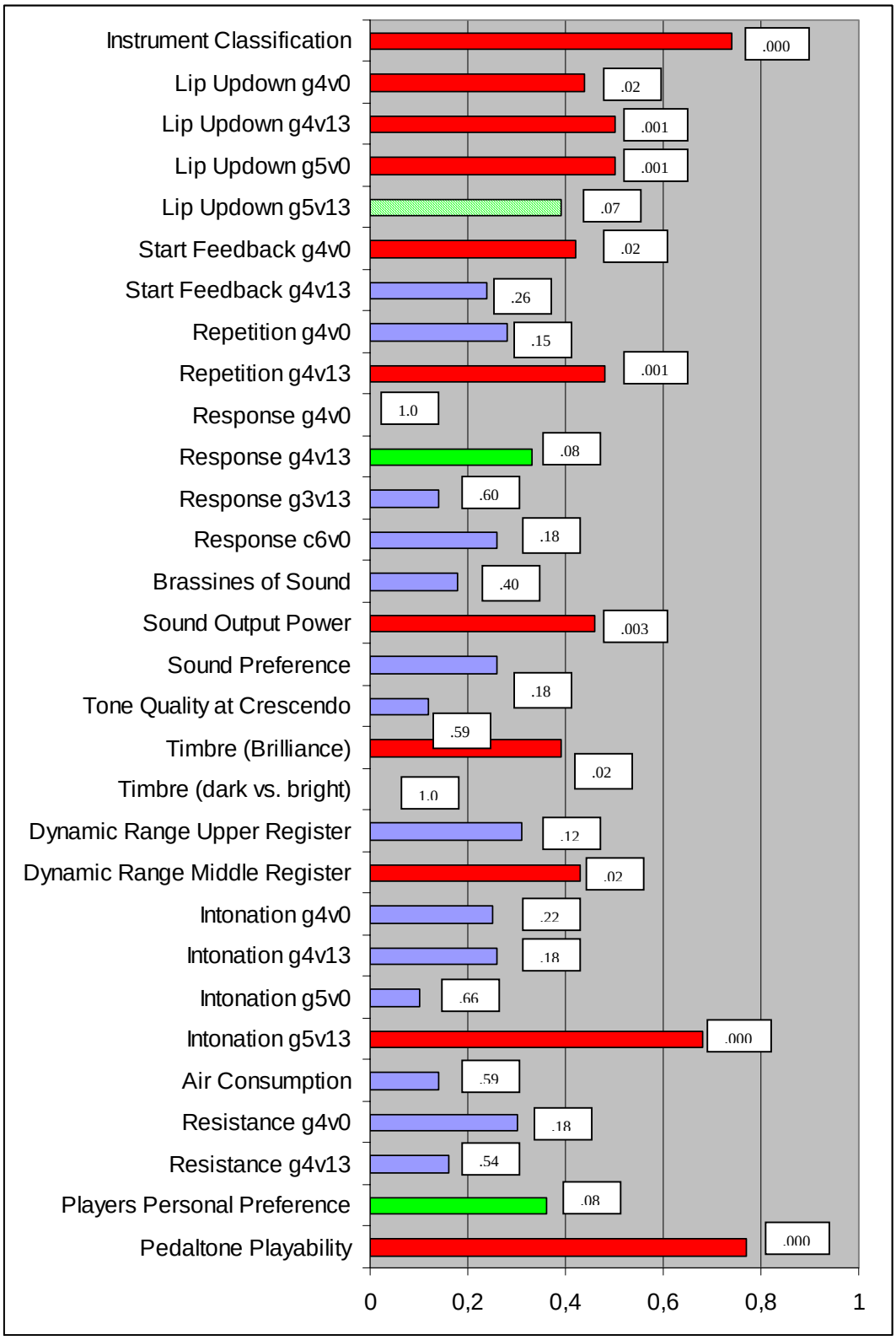

Fig. 6 Beams represent Kendall's Tau-b. Red beams represent reliable judgments (i.e. high association between test repetitions), green beams stand for correlation coefficients just over significance niveau 0.05, and blue beams represent a low correlation. Shaded beams represent mean differences between the two judgments. The values in the textboxes are the probability values (*p*-values) of the obtained values of Kendall's Tau under null-hypothesis of no association between the two judgments; a *p*-value less than 0.05 means significant deviation from the null-hypothesis.

Unexpectedly also ***intonation*** showed a good reliability only for valve position 13 and high register. This could be due the fact that intonation is also influenced by the music context. Furthermore, each player has his subjective intonation, which can vary from objective intonation as measured by impedance measurement system like BIAS [1,3].The pedaltone playability is very reliable. It was found, that this characteristic is due to the player and not to the instrument. Some can play it, some not.

2. Factor analysis

Factor analysis was done using only the reliable questions (except overall instrument classification) and the sample of the first playing tests of the musicians with the individual trumpet combinations (n=215). The results are shown in Table 3. Three independent factors with eigenvalue > 1, which explain 54.14% of the variance and are identical with Parts I, II, and III of the questionnaire, were identifiable.

1. Flexibility vs. tone center (lip up / down)
2. Sound: Brilliance, Output Power, Dynamic Range
3. Start of the Tone: Start Feedback, Repetition, Response

Table 3: Rotated Component Matrix

	Component		
	1	2	3
A(01a) Start Feedback (g4v0)	-,044	-,217	**,571**
A(04b) Response (g4v13)	,073	-,107	**,682**
A(02b) Repetition (g4v13)	,040	-,095	**,666**
A(07e) Intonation (g5v13)	-,216	,013	,244
A(09a) Lip updown (hard easy) (g4v0)	**,720**	-,080	-,298
A(09b) Lip updown (hard easy) (g4v13)	**,703**	,053	-,104
A(09d) Lip updown (hard easy) (g5v0)	**,766**	-,023	,136
A(09e) Lip updown (hard easy) (g5v13)	**,667**	,059	,232
A(10a) Dynamic Range Middle register (g4)	-,036	**,718**	-,132
A(13) Timbre (Brilliance)	,160	**,699**	-,205
A(17) Sound Output Power	-,090	**,816**	-,045
Percent of variance explained	21.35	17.51	15.28

Method of extraction: Principal Component Analysis.
Method of rotation: Varimax with Kaiser-normalization.

All questions except *Intonation* load only on those factors, for which this was hypothesized. Intonation showed no significant loading with either of the factors. This fact, however, is not surprising, because players have been asked to neglect to intonation when judging on the other questions.
The results of the factor analysis confirm the hypotheses about the latent dimensions behind the single questions and support the goodness and the validity of the questionnaire and the measured characteristics.

TRP QUESTIONS ABOUT THE INSTRUMENT

Question 01: „How fast is the feedback at the start of the note?“ „How quickly does the note speak?“ // Answers: [-2] very quickly /[-1] /[-0] ok /[+1] /[+2] not quickly, slow

Question 02: „How quickly can the note be repeated? Play 32nd notes staccato!“ // Answers: [-2] fast /[-1] /[-0] ok, normally /[+1] /[+2] not so fast
Question 04: „How quietly can the note be played? How easily does it speak at p // Answers: [-2] very easily /[-1] /[-0] ok, normally /[+1] /[+2] not easily
Question 05: Is the pedal tone (fundamental) playable? // Answers: [0] no [1] yes, with difficulty [2] yes, easily
Question 06: „Required air (energy) for maintaining a forte note?“ // Answers: [-2] very low, not much air /[-1] /[-0] ok /[+1] /[+2] very high, alot of air
Question 07: „How is the intonation of single notes?“ // Answers: [-2] very flat /[-1] /[-0] ok /[+1] /[+2] very sharp
Question 08: „Blowing resistance (maintaining a forte note)“ // Answers: [-2] very low /[-1] /[-0] ok /[+1] /[+2] very high
Question 09: „How easily are the notes lipped, or how centered are they?“ // Answers: [-2] lick up or down difficult, note is extremly centered /[-1] /[-0] ok, normally /[+1] /[+2] lick up or down easy, note is not so centered
Question 10: How is the dynamic range of the trumpet (ppp to fff) // Answers: [-2] very small [-1] [-0]ok [+1] [+2] very large
Question 11: „Tone quality (bright- dark)“ // Answers: [-2] very dark /[-1] dark /[-0] ok, neutral /[+1] bright /[+2] very bright
Question 13: „Tone color quality (colorless- brilliant)“ // Answers: [-2] very colorless /[-1] /[-0] ok, neutral /[+1] /[+2] very brilliant
Question 14: „Tone qualilty (thin- full, round, open)“ // Answers: [-2] very thin, flat /[-1] /[-0] ok /[+1] /[+2] very full and round
Question 16: „Tonal preference, Sound preference“ // Answers: [-2] don‘t like it /[-1] /[-0] ok, neutral /[+1] /[+2] like it alot
Question 17: „Tonal power, Radiation (weak- strong)“ // Answers: [-2] very weak /[-1] /[-0] ok /[+1] /[+2] very strong
Question 19: „Tendency to split notes, or to „scream“; (brassiness)“ // Answers: [-2] very little /[-1] /[-0] normal, ok /[+1] /[+2] very much
Question 31: „This instrument is appropriate for which player level?“ // Answers: [1=prof.], /[2=semi-prof.], /[3=student], /[4=advanced], /[5=beginner]
Question 44: „How do you like the instrument on the whole?“ // Answers:[-2] very bad /[-1] rather bad /[-0] neutral /[+1] rather good /[+2] very good

GERMAN VERSION OF THE QUESTIONS

Q01: Tonbeginn, Feedback: Wie schnell startet der Ton, wie schnell spricht er an? [-2] schnell [-1] [-0]Ok [+1] [+2] langsam
Q02: Wie schnell kann man repetieren, 32tel spielen [-2] schnell [-1] [-0]normal, ok [+1] [+2] nicht so schnell (langsam)
Q04: Wie leise kann man das g1 anspielen? Wie leicht spricht pp es an? [-2]sehr leicht [-1] [-0] OK, normal [+1] [+2] nicht leicht
Q05: Ist der Pedalton spielbar? [0] nein [1] ja, schwerlich [2] ja, leicht
Q06: Energiebedarf (forte Ton aushalten) Luftbedarf [-2]sehr niedrig, wenig Luft [-1] [-0]ok [+1] [+2] sehr hoch, viel Luft
Q07: Intonation Einzeltöne sehr tief[-2] [-1] [-0] OK [+1] [+2] sehr hoch
Q08: Blaswiderstand (forte Ton aushalten) sehr niedrig [-2] [-1] [-0]ok [+1] [+2] sehr hoch
Q09: Wie leicht lassen sich Töne ziehen bzw. rasten sie ein? : schwer ziehen, rastet mehr [-2] [-1] [-0]ok [+1] [+2] leicht ziehen, wenig einrasten
Q10: Dynamikumfang [-2]sehr klein [-1] [-0]ok [+1] [+2] sehr groß
Q11: Klang (dunkel- hell): [-2]sehr dunkel [-1] [-0]ok, neutral [+1] [+2] sehr hell
Q13: Klang (matt - brillant): [-2]sehr matt [-1] [-0]ok, neutral [+1] [+2] sehr brillant
Q14: Klang (flach - voll, rund aufgehend): [-2]sehr flach [-1] [-0]ok [+1] [+2] sehr voll & rund
Q15: Klangmodulierbarkeit, Ausdrucksmöglichkeiten: [-2] schlecht, farblos [-1] [-0]ok,neutral [+1] [+2] gut modulierbar, farbenreich
Q16: Klangpräferenz: [-2] gefällt nicht [-1] [-0]ok [+1] [+2] gefällt sehr
Q17: Klangabstrahlung, Power (schwach-kräftig): [-2]sehr schwach [-1] [-0]ok [+1] [+2] sehr kräftig
Q18: Klangtragfähigkeit, Projektion: [-2]sehr gering [-1] [0]ok [+1] [+2] sehr gut tragfähig (Wie gut man im Orchester durchkommt)
Q19: Neigung zum „schmettern“ schreien? [-2]sehr gering [-1] [-0]normal, ok [+1] [+2] sehr stark ausgeprägt
Q31: Eignungen bis Spieler-Level (1, 2, 3, 4, 5)
Q44: Wie gefällt Ihnen das Instrument insgesamt ? [-2]sehr schlecht [-1] [-0] neutral [+1] [+2] sehr gut

TRP KYSYMYKSIÄ SOITTIMESTA

Kysymys 01: “Kuinka nopea on sävelen alussa tuntuva “palaute” (feedback)?“ “Kuinka nopeasti sävel alkaa soida (syttyy)?“ // Vastaus: [-2] erittäin nopea /[-1] /[-0] ok /[+1] /[+2] ei nopea, hidas

Kysymys 02: “Kuinka nopeasti sävelen toistoja voidaan soittaa? Soita 1/32-nuotteja staccatossa!“ // Vastaus: [-2] hyvin nopea /[-1] /[-0] ok, tavallinen /[+1] /[+2] ei kovin nopea

Kysymys 04: “Kuinka hiljaa sävel voidaan soittaa? Kuinka helposti soi ppp?“ // Vastaus: [-2] erittäin helppo/[-1] /[-0] ok, tavallinen /[+1] /[+2] vaikea

Kysymys 05: “Onko pedaaliääni (pieni c) soitettavissa?” // Vastaus: [0] ei [1] kyllä, vaikeasti [2] kyllä, helposti

Kysymys 06: “Forte-sävelen ylläpitämiseen tarvittava ilmamäärä (energia)” // Vastaus: [-2] hyvin pieni, ei paljon ilmaa /[-1] /[-0] ok /[+1] /[+2] hyvin suuri, paljon ilmaa

Kysymys 07: “Millainen on yksittäisten sävelten intonaatio?” // Vastaus: [-2] hyvin matala /[-1] /[-0] ok /[+1] /[+2] hyvin korkea

Kysymys 08: “Puhallusvastus (forte-säveltä soitettaessa)” // Vastaus: [-2 hyvin pieni /[-1] /[-0] ok /[+1] /[+2] hyvin suuri

Kysymys 09: “Kuinka helposti säveliä voi taivuttaa (“lipped”), tai kuinka keskitettyjä ne ovat?” // Vastaus: [-2] taivutus ylös tai alas vaikeata, sävel erittäin keskitetty /[-1] /[-0] ok, tavallinen /[+1] /[+2] ylös tai alas taivuttaminen helppoa, ei kovin keskitetty

Kysymys 10: “Milainen on trumpetin dynaaminen ulottuvuus (ppp - fff) // Vastaus: [-2] hyvin pieni [-1] [-0]ok [+1] [+2] hyvin suuri

Kysymys 11: ”Äänen sävy (kirkas – tumma) // Vastaus: [-2] hyvin tumma /[-1] tumma /[-0] ok, neutraali /[+1] kirkas /[+2] hyvin kirkas

Kysymys 13: “Äänen väri (väritön – loistokas)” // Vastaus: [-2] hyvin väritön /[-1] /[-0] ok, neutraali /[+1] /[+2] hyvin loistokas

Kysymys 14: “Äänen laatu (ohut – täyteläinen, pyöreä, avoin)” // Vastaus: [-2] hyvin ohut, lattea /[-1] /[-0] ok /[+1] /[+2] hyvin täyteläinen ja pyöreä

Kysymys 16: “Äänellinen ja soinnillinen miellyttävyys” // Vastaus: [-2] en pidä /[-1] /[-0] ok, neutraali /[+1] /[+2] pidän paljon

Kysymys 17: “Äänen voima ja kantavuus (heikko – vahva)” // Vastaus: [-2] hyvin heikko /[-1] /[-0] ok /[+1] /[+2] hyvin vahva

Kysymys 19: “Taipumus äänten halkeamiseen tai “huutamiseen” (peltisyys) // Vastaus: [-2] hyvin vähän /[-1] /[-0] normaalisti, ok /[+1] /[+2] hyvin paljon

Kysymys 31: ”Minkä tasoiselle soittajalle tämä instrumentti sopii?” // Vastaus: [1=ammatil.], /[2=puoli-amm.], /[3=opisk.], /[4=edistyneelle], /[5=vasta-alk.]

Kysymys 44: “Kokonaisarvio instrumentista?” // Vastaus:[-2] kovin huono /[-1] välttävä /[-0] tyydyttävä /[+1] aika hyvä /[+2] erittäin hyvä

Fig. 7 Trumpets #14, #19 and #21 with 2 add. bells

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