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Maintaining skill across the life span: Magaloff's entire Chopin at age 77

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The study is based on a corpus containing the entire works of Chopin performed by Nikita Magaloff at the age of 77, precisely measured and fully annotated with score information. On this data we test a model of successful aging, including selection, optimisation and compensation hypotheses (SOC). We identify performance errors, compare Magaloff's Etudes with recordings by 14 other renowned pianists, and investigate specific age effects in a selected Nocturne in 14 different recordings.

Keywords: Performance errors; symbolic data; SOC model; aging virtuosity; piano performance

Many renowned pianists perform with great success up to old ages (e.g., W. Backhaus played his last concert at 85, V. Horowitz at 84, C. Arrau at 88). The demands posed by performing publicly are enormous (motor skills, memory, physical endurance, stress factors, see Williamon, 2004). Theories of human life-span development identify three factors to be mainly responsible for "successful aging": selection, optimization, and compensation (SOC model, Baltes & Baltes 1990). Applied to piano performance this would imply that older pianists play a smaller repertoire (selection), practice these few pieces more (optimization), and hide technical deficiencies by reducing the tempo of fast passages, while maintaining tempo contrasts between fast and slow passages (compensation) (Vitouch 2005).

In this study, we examine a unique corpus of Chopin performances by Nikita Magaloff, recorded on stage at age 77. We test whether Magaloff actually used strategies identified in the SOC model to master this unprecedented project. First, we assess his performance by quantifying performance errors. Second, we analyse recordings of the Etudes by other renowned pianists of the Etudes to test whether Magaloff's performance tempi were slower than those of the others. And finally, we examine whether tempo contrasts are maintained when fast sections are performed slower at older ages by analysing a number of recordings of the Nocturne Op. 15 No. 1

(*Andante cantabile*) that contains a fast technically demanding middle section (*con fuoco*).

METHOD

Material

In Spring 1989, Magaloff performed the entire work of Chopin for solo piano that was published during Chopin's lifetime (op. 1–64) in six public appearances at the Vienna Konzerthaus. These concerts were recorded with a Bösendorfer computer-controlled grand piano that provides a huge set of symbolic performance data with highest precision - 156 pieces over 320,000 performed notes, about 10 hours of performed music.

To put Magaloff's Etudes performances into context, recordings of the Etudes by the following performers were also analysed (a total of 289 performances): Arrau (recorded 1956), Ashkenazy (1975), Backhaus (1928), Biret (1990), Cortot (1934), Gavrilov (1985), Giusiano (2006), Harasiewicz (1961), Lortie (1986), Lugansky (1999), Magaloff (1975), Magaloff (1989), Pollini (1972), Schirmer (2003), Shaboyan (2007), Sokolov (1985).

The 14 recordings of the Nocturne Op. 15 No. 1 were by Argerich (1965), Arrau (1978), Ashkenazy (1985), Barenboim (1981), Harasiewicz (1961), Horowitz (1957), Leonskaja (1992), Maisenberg (1995), Magaloff (1975), Perahia (1994), Pires (96), Pollini (68), Richter (68), and Rubinstein (1965).

Procedure

To make Magaloff's performances accessible for analysis, the entire Chopin scores were scanned (946 pages) and subsequently converted into a digital format (musicXML) using a commercial optical music recognition software and custom-made post-correction steps. The data of Magaloff's performances were then semi-automatically matched to the symbolic scores building a huge corpus with precise performance information for all score notes and vice-versa. Based on the alignment, performance errors were categorized as insertion, deletion or substitution errors. We extracted basic tempo values[1] of Magaloff's performances of the Etudes op. 10 and op. 25 in order to compare them with recordings by the other famous pianists. These audio recordings were semi-automatically beat-tracked using the software *Beatroot* (Dixon, 2007) to determine the expressive timing at the beat level; tempo values were then extracted as before.

[1] A basic tempo value was estimated by the mode value, the most frequent bin of a inter-beat interval histogram with a bin size of 4% of the mean inter-beat interval.

Table 1. Error percentages by piece category and error type.

[%]	Ins	Del	Subs		Ins	Del	Subs
Rondi	*1.86*	2.40	2.50	Polonaises	**5.74**	**4.09**	1.54
Sonatas	4.2	3.63	1.82	Preludes	3.38	2.97	1.56
Mazurkas	2.44	3.41	1.0	Impromptus	*1.36*	*2.12*	0.89
Nocturnes	*2.22*	2.46	0.99	Scherzi	**6.15**	2.97	1.63
Etudes	3.90	**3.94**	1.33	Ballades	**5.00**	2.33	1.23
Waltzes	2.48	3.53	1.26	Pieces	4.36	3.49	2.27

RESULTS

Performance Errors

Overall, Magaloff's data contained 3.73% insertion, 3.28% deletion, and 1.52% substitution errors. This is slightly higher than what Repp (1996) reported for other pianists (1.48% insertion, 0.98% deletion, and 0.21% substitution errors), but comparing the particular piece used by Repp (op. 28/15), the error percentages were similar. With a percentage higher than 5%, the Scherzi, Ballades and Polonaises stand out among the categories of pieces in terms of insertion errors (Table 1). The “Allegro de Concert” op. 20 in the category “Pieces” shows an exceptionally high insertion percentage (6.77%). With an insertion percentage below 2.3%, the Nocturnes, Rondi and Impromptus constitute the low-insertion categories. The Impromptus are also the category with the lowest percentage of deletion errors (2.12%), while the Etudes and Polonaises exhibit the highest percentage of deletions among the categories.

Performance tempo of Etudes

Table 2 shows the tempo modes obtained for all pianists. Each performance is named by the first two letters of the pianist followed by the pianist’s age at the time of the recording. For the sake of comparison the metronome indications from the Henle Edition (Zimmermann, 1983) of the Etudes were added (HEN). In 12 of the 18 pieces Magaloff's tempo is within a 10% range of the metronome markings of the Henle edition. Three pieces are more than 5% slower and three pieces more than 5% faster compared to the metronome markings. Compared to the performances of 14 other recordings (including an earlier performance by Magaloff in 1975) Magaloff's performances of the Op. 10 Etudes are on average 1.2% slower than the average over all other recordings. The Op. 25 Etudes are on average about 5.6% slower than the average performance.

Table 2. Tempo modes of different pianist for selected pieces from op. 10 and op. 25. Entries are named by the first two letters of the pianists' name and their age at recording.

op10/1	op10/2	op10/4	op10/5	op10/7	op10/8
BI49 157	BI49 129	HA29 157	SH32 104	BI49 232	BI49 142
HA29 159	**MA77** 139	BI49 157	**MA63** 111	**MA63** 237	HA29 157
SH32 163	SH32 140	AR53 161	LO27 115	HA29 242	SH32 157
CO56 164	HEN 144	SC31 165	**MA77** 115	SC31 243	**MA63** 159
MA63 165	HA29 145	**MA63** 166	AS38 115	**MA77** 244	BA44 168
SC31 169	**MA63** 145	SH32 169	HEN 116	SH32 248	SC31 173
AS38 170	CO56 149	LO27 169	BI49 117	HEN 252	LO27 174
MA77 170	AR53 152	PO30 169	SC31 117	AR53 252	GI33 174
HEN 176	SC31 152	**MA77** 170	GI33 118	GA30 254	**MA77** 174
PO30 178	PO30 152	GI33 174	CO56 120	LU27 256	HEN 176
LO27 179	LO27 156	AS38 174	LU27 120	LO27 256	AS38 177
BA44 179	AS38 157	CO56 175	AR53 121	CO56 263	CO56 178
LU27 180	LU27 159	HEN 176	HA29 122	AS38 264	AR53 179
GA30 190	GI33 165	LU27 179	PO30 123	PO30 266	PO30 180
GI33 191	GA30 173	BA44 191	GA30 131	GI33 271	GA30 188
AR53 196	BA44 176	GA30 197	BA44 139	BA44 285	LU27 190

op10/10	op10/12	op25/1	op25/2	op25/4	op25/5
BI49 426	PO30 64	HA29 77	AS38 102	AR53 65	**MA63** 168-157-179
BA44 450	LO27 64	AS38 84	HA29 103	HEN 80	HEN 184-168-184
MA63 467	**MA63** 65	LO27 91	LO27 104	BA44 84	HA29 189-108-190
SC31 471	SC31 66	LU27 93	**MA77** 106	**MA77** 85	**MA77** 190-178-184
HEN 480	LU27 66	SO35 94	AR53 109	BI49 87	GI33 190-156-204
SH32 480	AS38 66	GA30 102	**MA63** 111	**MA63** 87	LO27 191-109-217
AR53 483	HA29 68	**MA63** 102	HEN 112	PO30 88	AR53 198-116-180
LU27 487	BA44 71	BI49 103	GA30 113	CO57 89	GA30 198-144-210
HA29 505	SH32 71	HEN 104	LU27 116	HA29 92	LU27 198-150-185
GA30 508	**MA77** 72	**MA77** 104	SO35 118	GI33 93	BI49 198-150-185
AS38 512	BI49 74	AR53 104	GI33 122	GA30 95	PO30 210-160-210
PO30 513	CO56 75	GI33 105	BI49 123	SO35 100	AS38 210-112-226
LO27 529	HEN 76	BA44 109	PO30 125	LU27 100	SO35 211-125-195
CO56 542	GI33 77	PO30 111	CO57 128	LO27 102	BA44 218-173-203
MA77 550	GA30 87	CO57 118	BA44 138	AS38 106	CO57 243-168-242
GI33 574	AR53 88				

op25/6	op25/8	op25/9	op25/10	op25/11	op25/12
HEN 69	BI49 64	BI49 94	**MA77** 64- 90-65	HA29 51	HA29 58
MA63 70	HA29 66	HA29 104	BI49 64-106-68	BI49 53	**MA77** 62
BI49 71	HEN 69	AR53 107	LO27 67- 86-70	**MA63** 58	**MA63** 69
AR53 71	GA30 69	**MA77** 107	BA44 71-112-70	GI33 59	AS38 70
CO57 73	**MA63** 69	LU27 107	AR53 71- 96-68	**MA77** 60	LO27 73
PO30 74	AR53 70	CO57 110	AS38 71- 84-70	LO27 61	CO57 73
BA44 74	LO27 71	HEN 112	**MA63** 71-100-70	CO57 61	BI49 74
MA77 75	**MA77** 71	PO30 113	CO57 71-127-71	AS38 62	GI33 74
AS38 75	CO57 73	**MA63** 115	HEN 72-126-72	LU27 63	SO35 76
HA29 75	GI33 73	GI33 117	PO30 72-104-74	PO30 63	LU27 76
LO27 77	AS38 73	LO27 118	GI33 74-129-73	AR53 63	PO30 76
GI33 78	PO30 76	GA30 120	HA29 74-112-76	SO35 66	AR53 77
LU27 83	LU27 77	AS38 125	LU27 75- 96-71	HEN 69	HEN 80
GA30 84	BA44 78	SO35 125	SO35 83- 86-87	BA44 69	BA44 82
SO35 85	SO35 81	BA44 131	GA30 86-117-81	GA30 71	GA30 83

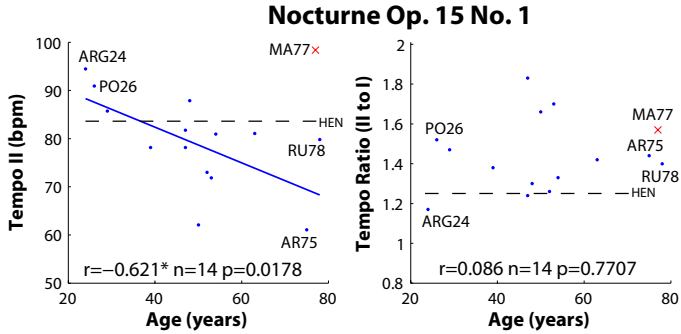

Figure 1: Nocturne op. 15 No. 1 performed by 14 pianists and Magaloff: Basic tempo of middle section (left) and tempo ratio between middle and first section (right) against performer's age. Dashed lines indicate given tempo (left) or tempo ratio (right) by Henle edition; the solid regression line is only drawn when correlation was significant (left).

Comparing Magaloff's recordings at the age of 63 and 77, the tempi vary to a surprising degree, but no systematic tempo decrease in the latter can be found. On the contrary: in 12 pieces out of 18 the recording at age 77 is faster, sometimes to a considerable degree (up to 17% in op. 10 No. 10). On the whole, no significant correlation of pianist age and performance tempo could be established.

Age effects and tempo contrast in a Nocturne

For an exemplary piece containing tempo contrasts, we examined the tempo values in performances of the Nocturne op. 15 No. 1 by 13 other pianists. We found a significant correlation between the performance tempo of the middle section and the age of the performer (the older, the slower, see Figure 1 left panel). However, the tempo ratios between the contrasting sections of the piece showed no overall age effect, confirming Vitouch's (2005) interpretation of the SOC model. Age seemed to have no effect on Magaloff's Nocturne, he played faster than the youngest of the performers while keeping a comparable tempo ratio. The same tendency could be found in op. 25 No. 10, however the negative correlation was not significant.

DISCUSSION

Based purely on the fact that Magaloff performed the entire piano works by Chopin, we can refute the selection part of the SOC model. Due to missing information about Magaloff's practice regime before and during the

performance period, we cannot make a statement about optimization processes. Magaloff's performance tempi do not point to compensation processes, which were indeed found in recordings by other famous pianists. However, his relatively high error rates may indicate that Magaloff aimed at realizing his musical ideas of Chopin's work rather than at error-free performances. In sum, Magaloff's data does not seem to corroborate the SOC model. This study is the first of its kind to examine a huge corpus of symbolic performance data of the entire work of a composer and to put it into context of a substantial number of other recordings.

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