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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, optimization, 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. Backhaus played his last concert at 85, Horowitz at 84, 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 and 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 analyze recordings of the etudes by other renowned pianists to test whether Magaloff's performance tempi were slower than those of the

others. Finally, we examine whether tempo contrasts are maintained when fast sections are performed slower at older ages by analyzing recordings of the *Nocturne Op.15 No.1 (Andante cantabile)*, which contains a fast, technically demanding middle section *(con fuoco)*.

METHOD

Materials

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 analyzed (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), and 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 from 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 (see Note) 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.

Table 1. Error % by piece category and error type (i.e. insertion, deletion, substitution).

	Ins.	*Del.*	*Sub.*		*Ins.*	*Del.*	*Sub.*
Rondi	1.86	2.40	2.50	Polonaises	5.74	4.09	1.54
Sonatas	4.20	3.63	1.82	Preludes	3.38	2.97	1.56
Mazurkas	2.44	3.41	1.00	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 Repp's (1996) account for other pianists (1.48%, 0.98%, and 0.21%, respectively), 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 in terms of insertion errors (see 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.

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) were added (HEN). In 12 of the 18 pieces, Magaloff's tempo (MA) is within a 10% range of the Henle indications. Three pieces are more than 5% slower and three pieces more than 5% faster compared with the metronome markings. Compared with 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.

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

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 age at recording.

Op.10/1		*Op.10/2*		*Op.10/4*		*Op.10/10*		*Op.10/12*		*Op.25/1*	
BI49	157	BI49	129	HA29	157	BI49	426	PO30	64	HA29	77
HA29	159	**MA77**	139	BI49	157	BA44	450	LO27	64	AS38	84
SH32	163	SH32	140	AR53	161	**MA63**	467	**MA63**	65	LO27	91
CO56	164	HEN	144	SC31	165	SC31	471	SC31	66	LU27	93
MA63	165	HA29	145	**MA63**	166	HEN	480	LU27	66	SO35	94
SC31	169	**MA63**	145	SH32	169	SH32	480	AS38	66	GA30	102
AS38	170	CO56	149	LO27	169	AR53	483	HA29	68	**MA63**	102
MA77	170	AR53	152	PO30	169	LU27	487	BA44	71	BI49	103
HEN	176	SC31	152	**MA77**	170	HA29	505	SH32	71	HEN	104
PO30	178	PO30	152	GI33	174	GA30	508	**MA77**	72	**MA77**	104
LO27	179	LO27	156	AS38	174	AS38	512	BI49	74	AR53	104
BA44	179	AS38	157	CO56	175	PO30	513	CO56	75	GI33	105
LU27	180	LU27	159	HEN	176	LO27	529	HEN	76	BA44	109
GA30	190	GI33	165	LU27	179	CO56	542	GI33	77	PO30	111
GI33	191	GA30	173	BA44	191	**MA77**	550	GA30	87	CO57	118
AR53	196	BA44	176	GA30	197	GI33	574	AR53	88		

Op.25/6		*Op.25/8*		*Op.25/9*		*Op.25/10*		*Op.25/10*		*Op.25/12*	
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

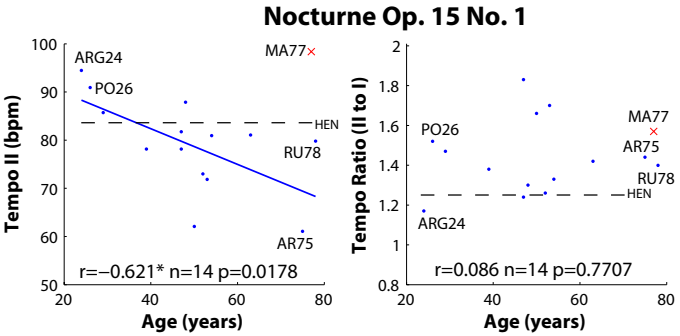

Figure 1. Nocturne Op.15 No.1 by 14 pianists and Magaloff: basic tempo of middle section (left) and tempo ratio between middle and first section (right) against performer's age. Dashed lines indicate given tempo (left) or tempo ratio (right) by Henle edition.

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 age and 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 14 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). 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 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 his practice regime before and during the performance period, we cannot make a statement about optimization processes. Magaloff's tempi do not point to compensation processes, which were indeed found with 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.

Note

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

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References

Baltes P. B. and Baltes M. M. (1990). Psychological perspectives on successful aging: The model of selective optimization with compensation. In P. B. Baltes and M. M. Baltes (eds.), *Successful Aging* (pp. 1-34). Cambridge: Cambridge University Press.

Dixon S. (2007). Evaluation of the audio beat tracking system BeatRoot. *Journal of New Music Research, 36*, pp. 39-50.

Goebl W., Pampalk E., and Widmer G. (2004). Exploring expressive performance trajectories: Six famous pianists play six Chopin pieces. *Proceedings of the Eighth International Conference on Music Perception and Cognition* (pp. 505-509), Adelaide, Australia: Causal Productions.

Goebl W., Flossmann S., and Widmer G. (2009). Computational investigations into between-hand synchronization in piano playing: Magaloff's complete Chopin. *Proceedings of the Sixth Sound and Music Computing Conference* (pp. 291-296), Porto, Portugal: Casa da Música.

Repp B. H. (1996). The art of inaccuracy: Why pianists' errors are difficult to hear. *Music Perception, 14*, pp. 161-184.

Vitouch O. (2005). Erwerb musikalischer Expertise [Acquisition of musical expertise]. In T. H. Stoffer and R. Oerter (eds.), *Allgemeine Musikpsychologie (Enzyklopädie der Psychologie)* (vol. D/VII/1, pp. 657-715). Göttingen, Germany: Hogrefe.

Williamon A. (2004). *Musical Excellence*. Oxford: Oxford University Press.

Zimmermann E. (1983). *Chopin Etüden, Urtext*. Munich, Germany: G. Henle Verlag.