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Prefatory Remarks

Performance ratings of chess masters in tournaments generally decrease after they have reached their prime. The time interval of optimal play of most masters appears to occur between the ages of 25 and 35 years. The general phenomenon of declining creativity and efficiency with age has, of course, been widely observed and commented upon throughout history.

There is, however, some basis to challenge the axiomatic character of this generalization. The purpose of this paper is to examine certain aspects of aging in master chess, particularly in relation to initiative and innovation during competitive play.

Aging in a Competitive Situation

A certain amount of individual impairment normally (or otherwise) occurs over time for all living things. In a competitive situation, however, two factors should be noted, the age of the individual and of his opposition. In sports that depend on individual rather than team performance, there is the further dichotomy, namely, how players fare in tournament and match play.

This analysis reviews the experience of chess grandmasters in tournament play. Few chess masters have engaged in serious match play throughout their entire competitive careers; tournament experience provides, therefore, a time sequence that more adequately provides data regarding age and performance.

Illustrative of the dual age process is the information presented in Table 1, Median Age of Lasker's Opponents in Selected Chess Tournaments: 1895-1936. Lasker's career spanned forty-seven years (1889-1936). For thirty-two years (1904-1936) or almost 70 percent of his active career, Lasker exceeded the median age of his opposition. The age differential widened with time after 1904. During the last decade of his chess activity (1927-36) he was the oldest competitor in his final four tournaments (1934-36).

Another example (Table 2) provides the age distribution data of the qualifying world champion interzonal tournaments from 1948-73. S. Gligoric (1923-), the Yugoslav grandmaster, has played in eight of the nine interzonal tournaments between 1948 and 1973. For these tournaments the mean age has varied between 30 and 37 and the median age between 29.5 and 38.3 years. Since 1955, Gligoric has exceeded the mean and median age of his competitors. His performance in the interzonals has fluctuated considerably since 1948 and has trended downward since 1958.

That the performance results of the chess master are influenced or affected by his age and that of his opposition has been commented on by various chess experts. Edward Lasker (1885-), an international chess master of broad experience, has stated:

"...Chess history, like the history of competitive physical sports, had shown that youth was bound to triumph.

"Physical endurance often made up for the greater experience and the finer positional understanding of an older master. Besides, the young players were catching up with the knowledge of their teachers with remarkable ease."

And psychologist Dr. Reuben Fine, a chess grandmaster, provides the complementary aspect:

> "...while older people (past 50) can retain skills they once had with little loss of ability, they find it difficult to learn new ones. It is this weakness which shows up in chess masters, because chess is always progressing, and those who stand still soon fall behind."

Innovation in Competition

A measure of innovation, though not necessarily an exclusive one, may be ascertained by examining "brilliancy" in chess play. To be sure, individuals regard such play in a very subjective manner--i.e., there are no standard and uniform rules or criteria to determine what constitutes brilliant play. Certain attempts have been made, however, to provide guidelines as to the elements of chess brilliancies.

For the present purpose, I accept the verdict of chess judges (or juries) that have determined which games deserve the accolade and the prize money for brilliancy or best-played games. Such determinations have been made since 1876.

In Table 3, Age Distribution of Brilliancy Prize Winners and Their Opponents in Master Chess: 1876 - 1955, data are provided, based on 77 games. Of interest, regarding the age factor, is that there is little discernible statistical difference, i.e., 0.4 years between the mean ages of the winners and losers. The breakdowns, by color of winner and loser, indicated only a slight difference of 0.5 years in the means between winner (white) and loser (black). Somewhat surprising, however, is the result between winner (black) and loser (white), showing a difference of 2.5 years, in favor of the older player with the black pieces. Possibly the small number of cases (20) affect the latter result. (Applying a t test indicates no statistically significant difference in these means).

The results suggest that age and innovation in master chess, as indicated by brilliancy prize awards, are substantively independent. Or to put these results in another way, older players contrive brilliancies on par with younger players. Combinatorial skill, a primary indicator of chess talent, does not appear to be adversely affected over the active career of chess masters.

The Age Distribution of a Brilliancy Prize Winner

Also of interest is the relationship of aging to brilliancy prize awards for individual chess masters. Le Lionnais discusses 239 brilliancy prize games covering the period 1876-1949. Alekhine (1892-1946) obtained 19 brilliancy prize awards, exceeding by far, the performances in this category of about 200 chess masters.

Alekhine's active chess career of almost four decades covered the years 1908-45. With the exception of two years, 1935-37, Alekhine was world chess champion from 1927 until his death in 1946. He obtained his first brilliancy prize in 1916 and his last in 1942.

Data in Table 4 show Alekhine's age, brilliancy prizes awarded and tournament participation. His most frequent brilliancies occurred in the tenyear period 1922-31 when he was in his thirties. It was in this period that he won the world championship from Capablanca (1927) and achieved highest rankings in major tournaments.

For the present purpose it is worth noting that 40 percent of his brilliancies occurred after age 40. Further study is needed to obtain a sample providing comparable analysis for other masters who have been awarded at least 10 or more brilliancy prizes. Such data could provide an input toward a defensible model of the general relationship of aging and chess performance under standardized conditions of competition.

Individual Tournament Performance and Age

The tournament careers of six grandmasters were examined in some detail. These competitors were W. Steinitz (1836-1900), J. H. Blackburne (1841-1924), S. Tarrasch (1862-1934), E. Lasker (1868-1941, S. Tartakower (1887-1956), and J. R. Capablanca (1888-1942).

The period of chess competition represented by this group is almost a century; Steinitz and Blackburne began their chess careers in the early 1860's while the last tournament in which Tartakower participated was 1954. Contrasting styles of master play underwent many changes in this sequence of competing chess generations. The six players selected are representative of three generations, two grandmasters from each time period. On the average these generations are separated by about twenty-five years. In each pairing there is a world champion and another grandmaster. Their tournament records reveal individual performance patterns of considerable interest.

Some Comparative Aspects of the Six Grandmasters

A summary (Table 5) provides comparative relevant information for each player over his active chess career. Perhaps the first point to be noted is that the profile for each player is unique although there are certain similarities. The records

of Steinitz, Capablanca and Tartakower provide performance profiles that suggest more general models or types.

While in every case a peak score is achieved after the first decade of play, the Capablanca profile provides the smoothest transition over time of the decrease in wins, the increase in draws, and relative stability in losses. The Steinitz profile, after his peak period shows the decrease in wins coupled with the increase in draws and losses over time. Tartakower reaches a peak and remains virtually level in the proportion of wins but, in his last decade of play (60-69), decreased in draws and increased in losses.

Additional information regarding the results for other grandmasters, playing the white and black sides, are needed. These tentative results indicate that the complex phenomenon called aging is of great variability as regards the initiative in chess. It is apparent that some masters, as revealed by their records, decline much faster than others. In the case of Tartakower, unlike Tarrasch, the decline is hardly apparent. For Blackburne his results after 70 were better, percentagewise, than in his sixties; but he only played 43 games in his last decade of play compared with 180 games a decade earlier, when he was 60-69.

Some variation regarding the optimal quinquennium age in tournament performance for eleven selected grandmasters is provided in Table 6. Two players, Tarrasch and Reti, did best in the age group 20-24 years. Four grandmasters, Blackburne, Tartakower, Alekhine and Keres were in the 25-29 year set. World champions, Steinitz, Lasker and Capablanca are in the 30-34 year age category. Gligoric in the 35-39 years and Nimzovich in the 40-44 years groups complete the table. This quinquennium breakdown, while of interest, contains an important limitation, namely, the number of games played. Thus, less than 75 games were played by 7 of the 11 grandmasters.

Older vs. Younger Competitors

As illustrative, let us consider the tournament record of Lasker's 36 losses between 1889-1936, taking into account his age and that of his victorious opponents. These data, including a breakdown by white and black, are detailed in Table 7.

The mean age of Lasker's losses is 44 years with a standard deviation of 17 years; the mean age of his opponents is around 34 years with a standard deviation of 11 years. The age distribution of Lasker's losses is U-shaped (comparable or analogous to a mortality curve). By contrast, the age distribution of the successful opponents is a reverse J-shaped curve. Additional data may reveal that these results are the rule with possibly few exceptions.

Of interest is the final performance in a major tournament of sixteen outstanding masters. These data, covering the 75 year period 1878 to 1953, provide detail as to age, score, rank and number of competitors in these tournaments. The variation of results is considerable, as is the age spread of 32 to 80 years. Only three players in this group (Anderssen, Lasker and Maroczy) scored .500 or better. Maroczy's record is perhaps the most unusual in this group; he drew every game. Tarrasch at Bad Kissingen in 1928 lost 3 and drew 8 games. Some of the grandmasters, even at the terminal point in their careers, were very hard to beat. The lowest score was that of Gunsberg in the great St. Petersburg tournament of 1914; he lost 8, and drew 2 games.

To whom do the oldest players lose in these tournaments? Part of the answer was suggested in the discussion on Lasker's losses. The results for some of the players may provide clues to enlarge or refine the solution to the question posed.

At Nottingham in 1936, when Lasker was 68, he lost three games, one each to R. Fine (1914-), S. Reshevsky (1911-) and S. Flohr (1908-); their respective ages then were 22, 25 and 28 years. Capablanca at the A.V.R.O. tournament of 1938 was 50. He lost four games; one each to P. Keres (1916-), Botwinnik (1912-), Alekhine (1892-1946) and M. Euwe (1901-). The respective ages of these players were 22, 26, 46 and 37 years. (The last three noted held the world chess championship during their careers). When Tarrasch made his farewell appearance at Bad Kissingen in 1928, at age 66, he lost three games, drew eight games and won none. His losses were to E. Bogolyuboff (1889-1952), A. Nimzovich (1886-1935) and R. Reti (1889-1929); they were respectively 39, 42 and 39 years old in 1928. Blackburne was 73 when he played in the St. Petersburg tournament of 1914. He lost five games, one each to Capablanca, Lasker, Tarrasch, Marshall and Janowski. These opponents in 1914 were respectively 26, 46, 52, 37 and 46 years of age. Burn was 64 in 1912 when he played at Breslau, losing seven games in a field of 18 competitors. He was beaten by Duras, Rubinstein, Teichmann, Schlechter, Tarrasch, Spielmann and Treybal. The respective ages of the victors were 30, 30, 44, 38, 50, 29 and 30.

In the foregoing none of the selected masters (Lasker, Tarrasch, etc.) lost to an older player. There may be a few exceptions to this result; for example, Gunsberg, age 60, lost to Blackburne, age 73, in the St. Petersburg Tournament of 1914. Perhaps examples of this type would suggest that when both players are beyond a certain age, e.g., 55-59 years, age differences are not of consequence. By and large, however, the older player (50 years and over) usually lost to players at least one and a half generations younger and less frequently to competitors that were closer to him in the time continuum.

The significance of this last point is related to the ideas suggested by Reuben Fine and Edward Lasker. They maintain that older players do not keep up with newer developments in the field of chess and that younger players become familiar with the chess style, strengths and weaknesses of the older players.

The phenomenon of aging in a competitive situation is quite complex. It involves physiological and psychological factors as well as cultural and/or technological factors relating to the state of the art.

The discussion throughout this paper relates only to men. If sufficient data existed for women chess players, both as to number of players, tournaments, and for a substantial time period, a comparable analysis would, I believe, be quite valuable. Data for women players is relatively scarce, although tournament competition among women has expanded in recent years. There is very little data for tournaments consisting of men and women competitors at master strength.

Summary of Findings

The foregoing discussion has attempted to focus on individual performance, over time, of certain identifiable aspects in master chess competition, namely, innovation and initiative. An attempt was also made to indicate the nature of the competitive milieu; how, with the increasing age of the master, there also develops, after he has reached the age of 35 years, an increasing difference between his age and the average age of his competitors. Or to put it another way, in tournament play, the master not only ages after 35, but his collective opposition grows younger.

Innovation in tournament competition, as measured by the winning of brilliancy prizes, is independent of the age factor. Thus the average age and standard deviations for seventy-seven winners and losers revealed no statistically significant differences. Further, the age distribution of the winners was approximately that of all competitors in a sample of many tournaments. This point may be stated in another way, i.e., the proportion of participation by age, in tournaments, was consistent with the age groups obtaining brilliancy prizes.

Another factor of interest, namely, the initiative, revealed generally expected results, but with certain exceptions. For a selection of six grandmasters, drawn from three successive generations, I obtained profiles, by age, of their overall scores, wins, draws, and losses. Additional detail on the playing with white and black pieces was developed for Emanuel Lasker and J. R. Capablanca.

The profile of each player is unique. Three distinct profiles appear as models for characterizing broader groups of chess masters. The Tartakower model is, perhaps, of special interest; it appears to reflect virtually no decline in performance with age and an amazing stability in the quality of play with regard to the three categories of wins, draws and losses. The Capablanca model is quite distinct, to wit, after peak performance, a continual decrease in wins, increase in draws and only a marginal slight increase in losses. The Steinitz model is characterized, after the optimal performance period, by a steady decrease in wins coupled with an increase in losses and in draws.

Lasker's profile is comparable to that of Capablanca. Of further interest is the data of games in which Lasker had the white and black pieces. It will be recalled that white has the initiative by rule of the first move. In his last three decades of play (40-69) Lasker won 44 games with white and 37 games with black; whereas in his first two decades of competition (20-39) he won 67 games with white and 52 games with black. Thus there is only a slight diminution in the initiative since the corresponding percentages of wins with white are 56 percent (early period) against 54 percent (later period).

Lasker's experience with draws perhaps best demonstrates the decline (though small for Lasker) in the initiative. Between 20 years and 40 years Lasker drew 40 games, of which 22 were with white and 18 with black. After 40, Lasker drew 62 games, 19 with white and 33 with black. Somewhat unusual is the lifetime result in that Lasker's total draws are evenly divided between white and black.

Throughout his tournament career Lasker lost 36 games, 11 with white and 25 with black. The proportion of losses with white is considerably greater after than prior to 40.

While the data on Lasker is based on total recorded tournament games, comparable data for Capablanca were developed on a (non-random) sample covering 25 percent of his total tournament games. Capablanca, over his career, won twice as often with white as with black and drew twice as often with black as with white. Of the 28 games he lost in thirty years of tournament play, about 90 percent were lost with the black pieces. Further detailed data are required to pinpoint the effect of age on the initiative in the case of Capablanca.

It appears, however, that declines in the advantage conferred by the initiative will vary considerably. Tartakower's record would imply no decline in the initiative. For most masters there is a decrease in performance after their peak period associated with white (the initiative) as well as with black. This result, however, cannot be attributed to a decline in mental ability or chess talent.

Concluding Remarks

On the basis of this preliminary exploration some conjectures appear plausible.

First, there are many patterns of "aging" in master chess. Not only are the rates of change, but the quality of the changes in performance over time, an individual matter. Additional study is required to define age profiles in master chess players.

A second point relates to the matter of chess ability; the power to reason in the strategic sense, is maintained almost unimpaired throughout the career of most masters. The effect of the younger opposition appears to be felt, first in physical and then in psychological terms.

The stress and strain of tournament play has several sequential aspects which differentially affect the older players. Sustained concentration, under time constraint rules, for a tournament period of 10 to 30 days probably favors the younger players. Recuperative power generally occurs sooner in younger than in older persons.

The psychological aspect is probably related to the inflexibility of the older player in adapting to new developments (e.g., in the openings) and to the adaptability of the younger player to the older player's style. The value of experience supersedes ambition and youth only to a point.

The second conjecture implies that it would be useful to study a group of masters (if possible grandmasters) born within, say, a five year age period. I think that the birth period of players born between 1880 and 1884, or 1885 and 1889, or in a consecutive five year period between 1880-1889 could provide a suitable cohort. Such a study would analyze how members of the cohort played against each other, and how they fared against competitors outside the cohort.

Another component of the aging problem in chess relates to stability of performance. There is a suggestion in some of the data that the master's performance, after the optimal period, undergoes a transition in the sense of becoming erratic. Younger players will, from time to time, be off form, that is, play quite badly in a particular tournament. This phenomenon appears to occur more frequently after a master has passed his peak period; it deserves systematic statistical investigation.

Age is recognized at the lower bound; there is a world junior championship and competition is restricted to players under 20. It would be useful and informative if tournaments could be based on suitable age ranges.

It is hoped that some of the conjectures that have been advanced will be analyzed. The records of master chess provide a data source of considerable value, provided that they are used with an understanding of their limitations. The implications of the present work for domains other than chess require separate explication.

NOTES AND REFERENCES

- Because of space limitations additional information regarding this paper may be obtained from the author.
- The age of the player at the time of the final tournament is shown in parentheses.

Anderssen (60); Bird (69); Blackburne (73); Burn (64); Capablanca (50); Gunsberg (60); Lasker (68); Maroczy (59); Marshall (54); Mieses (80); Pillsbury (32); Steinitz (63); Tarrasch (66); Tartakower (66); Tchigorin (57); Thomas (67).

Table 1 Median Age of Lasker's Opponents in Selected Tournaments 1: 1895-1936

Date	Tournament	Number of Opponents	Median Age 2/ of Opponents	Age of Lasker	Difference in Years (Lasker Younger -) (Lasker Older+)
1895	Hastings	21	42	27	-15
1896	Nurnberg	18	35	28	- 7
1899	London	14	38	31	- 7
1904	Cambridge Spring	15	34	36	+ 2
1909	St. Petersburg	18	28	41	+13
1914	St. Petersburg	10	37	46	+ 9
1923	Mahrisch-Ost.	13	35	55	+20
1924	New York	10	38	56	+18
1925	Moscow	20	34	57	+23
1934	Zurich	15	39	66	+27
1935	Moscow	19	30	67	+37
1936	Nottingham	14	37	·68	+31

The tournaments selected consist of 10 or more of Lasker's opponents.
Median age rounded to nearest year. The median age of the 187 opponents in the foregoing selected tournaments was 35.5 years.

Source: <u>Bmanuel Lasker</u> (two volumes of tournament and match games), edited by J. Gilchrist (The Chess Player, Nottingham, England, 1967-68).

Table 2

Age Distribution of Chess Masters in World Champion Interzonal Tournaments: 1948-73

Age Group	<u>1948</u>	то <u>1952</u>	UR 1955	N A 1958 1	M E 1962	N T 1964	¥ 1967	еа 1970	R 1973ª/	Total	Percent Distribution
15-19 vears	0	0	1	1	1	0	1	1	0	5	2.3
20-24 years	3	2	2	5	0	1	3	1	8	25	12.0
25-29 years	2	5	4	5	6	6	1	3	6	38	18.0
30-34 years	1	2	6	4	9	8	8	7	4	49	23.1
35-39 years	6	6	4	3	3	i	5	7	7	42	19.8
40-44 years	7	4	2	3	2	6	2	2	2	30	14.2
45-49 years	ò	2	2	ō	ī	ō	Ö	2	4	11	5.2
50-54 vears	ō	ō	ō	ō	ĩ	i	1	0	2	5	2.3
55-59 years	ō	ō	ō	ō	ō	1	1	1	2	5	2.3
60-64 years	1	0	0	0	0	0	0	0	1	2	1.0
Total	20	21	21	21	23	24	22	24	36	212	100.0
Mean	37.0	35.1	33.2	30.5	33.6	25.4	34.3	35.4	36.0	34.6	·
Standard	-										
Deviation	9.2	2 7.7	7.8	7.4	7.4	8.4	9.2	7.3	3 11.5	9.0)

a/ Two interzonal tournaments were held for 36 qualifying chess masters in 1973. Eighteen competitors made up each tournament; the age data were consolidated.

Sources: Anne Sunnucks, <u>The Encyclopedia of Chess</u>, (St. Martin's Press, N.Y., 1970), •pp. 380-391 for the years 1948-67. <u>Chess Life and Review</u>, January 1971, Vol.26, No. 1, p. 8 and September 1973, Vol. 28, No. 9, pp. 499-500 for the years 1970 and 1973 respectively.

Table 3. Age Distribution of Brilliancy Prize Winners and Their Opponents in Master Chess: 1876-1955

	Tota	al -	Winner	Played	Loser Played	
Age Group	Winner	Loser	White	Black	White	Black
10-19	0	1	0	0	1	0
20-29	21	23	18	3	7	16
30-39	38	33	26	12	6	27
40-49	10	11	8	2	3	8
50-59	5	6	3	2	1	5
60-69	2	3	1	1	2	0
70-79	1	0	1	0	0	1
Total	77	77	57	20	20	57
Mean	36.2	36.6	35.5	38.0	34.5	36.0
Stand.Deviation	10.4	11.3	11.0	10.0	14.3	10.2
Median	34.6	34.4	34.0	35.8	33.3	34.6

Source: Fred Reinfeld, <u>Great Brilliancy Prize Games of the Chess</u> <u>Masters</u> (Collier Books, Crowell-Collier Publishing Co., N. Y. 1961); I. A. Horowitz, <u>The Golden Treasury of</u> <u>Chess</u>, (Galahad Books, N. Y., 1969).

Table 4 Brilliancy Prizes Awarded A. Alekhine, by Age and by Tournament Participation: 1908-45

Alekhine's Age	Number of Tournament <u>Participations</u>	Number of Brilliancy Prizes Awarded ^{2/}	Ratio of Priges to Tournament
15-19	5	0	.000
20-24	13	1	.077
25-29	8	1	.125
30-34	8	6	.750
35-39	7	4	.571
40-44	16	2	.125
45-49	12	3	.250
50-54	11	2	. 182
Total	80	19	.238

1/ The number of tournaments shown is incomplete; the actual number is probably between 85 and 90.

2/ It is not known whether brilliancy prizes were awarded in every tournament.

Source: François Le Lionnais, <u>Les Prix de Beauté aux Echècs</u>. (Rev. Ed., Payot, Paris 1973).

Percentage Tournament Scores of Grandmasters by Age Group

Age Group

<u>Player</u>	20-29	30-39	40-49	<u>50-59</u>	<u>60-69</u>	<u>70-79</u>	Lifetime
Steinitz	.710	.820	.715	.615	.580		.685
Blackburne	.460	.750	.695	.560	.655	.590	.640
Tarrasch	.675	.805	.620	.540	.480		. 585
Lasker	. 765	.815	.7 9 5	. 765	. 595		. 740
Capab lanca	.825	.870	.725	.665			. 765
Tartakowar	.575	.610	.650	.640	,625		.630

Table 6

Optimal Tournament Performance in a Five-Year Age Period of Eleven Selected Grandmasters

		Games		Percent I	Distribution	n
Player	Age Period	Played	Wins	Draws	Losses	Score
Tarrasch	20-24	29	.655	.069	. 276	.690
Reti	20-2 4	190	. 500	. 205	. 295	.603
Blackburne	25-29	33	.515	.182	. 30 3	.606
Tartakower	25-29	71	. 479	. 380	.141	.669
Alekhine	25-29	43	.651	. 349	0	.826
Steinitz	30-34	58	.672	.104	.224	.724
Lasker	30-34	43	.767	.186	.047	.860
Capablanca	30-34	38	.789	.211	0	, 895
Gligoric ¹ /	35-39	197	.467	.459	.074	.697
Nimzovich	40-44	188	. 543	. 340	.117	.713
Kere s^{2/}	25-29	110	.573	. 336	.091	.741
<u>l</u> / S. Gligoric (192	3-) of Y	ugoslavia i	s an Inte	rnational G	randmaster.	

2/ P. Keres (1916-) of the U.S.S.R. is an International Grandmaster.

Table 7 Age Distribution of Victorious Tournament Opponents of Emanuel Lasker, by Color of Pieces: 1889-1936

	Number of Games Won by Successful Opponents (
Lasker's			Age Group			By Lasker			
Age Group	20-29	30-39	40-49	50-59	60-69	Total			
20-29	7	3	1	2	1	14			
30-39	i	2	ō	ī	ō	4			
40-49	2	ī	õ	ō	ŏ	3			
50-59	ī	2	õ	õ	ŏ	ž			
60-69	8	ō	4	õ	ő	12			
Total	19	8	5	3	1	36			
		Opponent	(White Pieces)						
Lasker's									
(Black Pieces)	20-29	30-39	40-49	50-59	60-69	Total			
20-29	6	3	0	1	1	11			
30-39	2	1	0	0	0	3			
40-49	1	2	0	0	Ó	3			
50-59	ì	1	0	0	0	2			
60-69	5	0	1	0	ō	6			
Total	15	7	1	1	1	25			
		Opponent	(Black Pieces)						
Lasker's									
(White Pieces)	20-29		40-49	50-59	60-69	Total			
20-29	1	0	1	1	0	3			
30-39	0	0	0	1	0	ì			
40-49	ō	ō	Ō	0	Ō	0			
50-59	ō	i	ō	0	ō	1			
60-69	3	0	3	0	. 0	6			
Total	4	1	4	2	0	11			