

Baseball Performance and the Relative Age Effect:

Does Little League Neutralize Birthdate Selection Bias?

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Baseball is arguably the number one spectator sport in a nation where sport, in general, appears to be the primary national interest. It should be no surprise then, that success as an athlete is highly sought after by young individuals, and that the reasons for success have been studied and speculated on by physical educators, business organizations, and by the families of promising athletes.

In contrast to many other sporting activities, Major League baseball shows a weak relative age effect. In order to determine the nature and extent of the influence of early experience on this finding, relative age was studied in a large sample of Little League players. An examination of the distribution of birth-months of 3414 players indicated that the relative age effect was not strong at this level, and that the age-related drop-out rate could not be explained by relative age disadvantage. The hypothesis was advanced that relative age effects may have been neutralized by the use of large age categories for the assignment of players for Little League play.

Generally, success in human performance activities is thought to be determined by the action, and interaction, of individual characteristics such as physique, ability, training, and motivation. Recent research, however, has demonstrated that the time of the year in which a person is born may have a profound effect on an individual's success in particular sporting activities.¹ The explanation for these provocative findings may be found in the concept of "relative age."

Whenever children are grouped together for a particular activity, be that school or recreational sports, they are generally placed into arbitrarily defined categories. Thus, children might be asked to start school if they turn six years of age between January 1 and December 31 of a stated year. Similarly, children playing Little League Baseball will be assigned a "playing age" related to a "baseball year" which begins on August 1 and ends on July 31.

Note: This document is a facsimile of the published document. Data and text are unchanged. The formatting has been altered slightly for readability.

Grouping children in this manner creates a situation wherein some children may be up to one year older, or younger as the case may be, than other children in the group. This difference of age between individuals in the same age category is referred to as "relative age."

Recent research on relative age differences between participants has demonstrated large effects on success in a variety of sporting activities.

Relative Age and Hockey

As a result of a serendipitous observation by Paula Barnsley, an examination was made of the birthdates of professional hockey players, and younger players in major developmental hockey leagues in Canada and the United States. The results demonstrated a striking relative age effect.² For example, in the major developmental leagues, which comprised players primarily between the ages of 18 to 20, it was shown that approximately 40% were born during the first three months of the "hockey year" (which corresponds to the calendar year). Further, approximately 30% were born during the second quarter of the year; 20% during the third quarter; and, 10% during the last quarter (October, November and December). These highly significant effects were attributed to the many advantages conferred on those individuals who were older than their playing mates in the same "age-determined" grouping.

In a subsequent study³ on minor league hockey, Barnsley and Thompson showed that relative age effects could be observed as early as the nine year old age group. Further results of this study demonstrated two important effects of relative age differences. Namely, children who were at a relative age disadvantage (born late in the "hockey year") were more likely to drop out of hockey, and players with a relative age advantage were shown to be more likely to play on the more competitive or elite teams.

The hypothesis put forward to explain these data is based on the assumption that the older children in a strictly defined age-grouping will enjoy the consequences of a clear developmental advantage. That is, the older children being generally larger, stronger, and better coordinated will, on average, perform better. As a result of their superior play, the older children will be more likely to develop feelings of self-efficacy⁴ and to be exposed to the likelihood of the "self-fulfilling prophecy" associated with the favourable perception of their capabilities and potential by their coaches.⁵ Furthermore, these children will be given additional advantages such as, being placed on higher calibre teams, more and better competition, better coaching, more ice time, and more recognition by friends and family because of their status as "athletes".

Relative Age and Soccer

In order to consider the generality of the relative age findings to another sport and to other countries, the birthdates of soccer player's were analyzed by Barnsley, Thompson and Legault.⁶ This study, which reported an examination of

the birthdates of players participating in the 1989 Under 20's and Under 17's world tournaments, found results almost identical to those previously observed in hockey. As in hockey, it was found that approximately 40% of the players were born in the first three months of the "soccer year" (which is defined as beginning on August 1 and ending on July 31). The remaining birth months, from November 4 through July, reflected a diminishing participation rate, plunging to less than 8% in the last quarter.

Hockey and Soccer Compared

Hockey and soccer have many similarities in regard to the organization and structure of their youth leagues. Although both sports encourage broad participation, both sports begin streaming players into competitive and elite leagues at an early age. It would appear that this process acts to maximize relative age effects by creating the situation whereby performance selections are made at young ages where maturational differences are more pronounced. Given the differential experiences provided by playing on elite teams at such an early age it is no wonder that performance discrepancies are found to be associated with birthdates among older players in both sports.

Relative Age and Baseball

Unlike hockey and soccer, baseball has traditionally organized its youth programs in quite a different fashion. First, baseball uses much larger age groupings than either of the other two sports. For example, in Little League, the "minor" league division comprises children from eight to twelve, while the "major" league division is made of children from nine to twelve. Neither hockey nor soccer have age groupings greater than two years in range.

Another important distinction between baseball and both hockey and soccer, is that in baseball the elite or competitive teams are chosen only for tournament play which typically occurs at the end of the season. This procedure is in sharp contrast to hockey and soccer programs which generally select players for elite teams at the beginning of the season. These elite teams then compete against other highly selected teams for the entire season.

Given these differences in sports and youth organizations, an examination of the relative age effect in baseball was initiated. First, it seemed important to determine if professional baseball players would exhibit different birth month rates based upon the "baseball year". Interestingly, Daniel and Janssen, in a study of a number of different sports, concluded that the relative age effect was not to be observed in Major League Baseball.⁷ However, Thompson, Barnsley and Stebelsky⁸ observed that Daniel and Janssen incorrectly defined the "baseball year" as running from September 1 to August 31. This mistake (the "baseball year" is from August 1 to July 31) had the effect of masking a small, but significant, relative age effect in Major League Baseball.

As noted, the relative age effect can be observed in Major League Baseball but,

in a much diminished form. The data show that approximately 29% of Major League Baseball players are born in the first three months of the "baseball year." The figures for the remaining quarters are: Quarter 2, 26.5%; Quarter 3, 23%; and, Quarter 4, 21.5%.⁹

The fact that the relative age effect is less pronounced in baseball than in hockey or soccer suggests the possibility that the organization of Little League Baseball may provide more equality of opportunity for success to all developing young players. If this were demonstrated to be the case, Little League Baseball could be looked upon as a superior model for the development of young players, at least in terms of player selection and assignment to teams. Given this situation and the potential outcome, the following study into the relative age effects in Little League Baseball was undertaken.

METHOD

Subjects

The male players on the rosters of all teams from the city of Ottawa, Canada, that were registered with Little League Baseball Canada for play during the 1990 season comprised the sample for this study. The decision to limit the study to male players was made because the relatively small number of female players (6.6%) would unfortunately not allow a valid consideration of gender differences.

Little League Divisions

Player assignment to the various divisions is determined by player age and ability.¹⁰ The League categories are described briefly below. Note that, in practice, a few players are found in a league that is not appropriate for their age.

T-Ball.	Five to eight years of age.
Minor League.	Eight to 12 years of age, with some out-of-range players noted. More competitive (players are likely to play in the Major Division).
Major League.	Nine to 12 years of age.
Junior League.	Thirteen year-olds only.
Senior League.	Thirteen to 15 years of age.
Big League.	Sixteen to 18 years of age, with some out-of-range players at the lower end.

Data Analysis

Data collected for each player included age (at the beginning of the season), league, and month of birth. For the purpose of analysis, player frequency counts were calculated for each quarter of the "baseball year" (Q1= August to October; Q2= November to January; Q3= February to April; Q4= May to July).

RESULTS

Participation and Relative Age

Figure 1 indicates that participation rates vary dramatically with age. The results show participation increasing up to eleven years of age, followed by a decline to age fifteen, and a sudden drop-off above that. Inasmuch as a cross-sectional analysis such as this is indicative of longitudinal patterns, these data confirm that, as is found in minor hockey,¹¹ there is a dramatic drop in participation during the later years of eligibility. However, the similarity does not extend to the finding of a relative age effect on the drop-out rate. A relative age effect on the participation rate would have produced a distribution gradient such that, among the older players, the greater proportion would have been born in the earlier months of the "baseball year". This would not necessarily be expected for the younger players because of their limited experience with competitive play. For the purpose of the analysis of this hypothesis, three-year age groupings were used to reduce the number of comparisons required, and to increase the sample size for each. Table 1 indicates that, the predicted pattern was not found. In fact, the analysis did not produce a statistically significant departure from a random distribution for any of the five age-groupings that were examined.

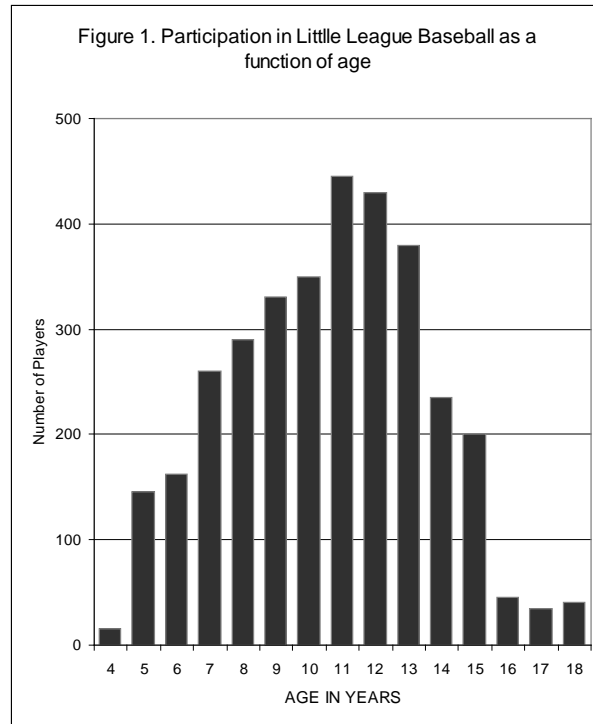


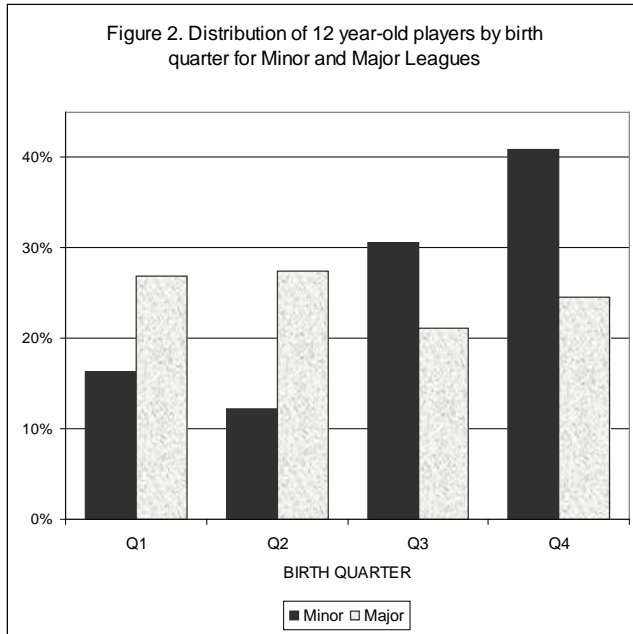
Table 1. Participation rates and birth-quarter by player age

Age	Number of Players				X ²	Sig
	Birth Quarter					
	Q1 Aug- Oct	Q2 Nov- Jan	Q3 Feb- Apr	Q4 May- Jul		
4-6	102	79	85	69	6.86	NS
7-9	232	219	219	224	0.51	NS
10-12	344	298	289	304	5.74	NS
13-15	214	179	211	219	4.80	NS
16-18	38	37	25	27	4.24	NS

Relative Age and Level of Play

In hockey, players are assigned to leagues according to relatively small age-groupings (usually 2 years), and then are placed on sub-levels (tiers) according to ability. Thus a comparison of tiers within age groupings is a relatively simple and logical matter. Little League Baseball, on the other hand,

uses age-groupings that span three, or more years, and there are no officially designated counterparts to hockey's tiers. Thus, a comparison of the distribution



of birthdates across leagues is not expected to shed any light on the relative age hypothesis. However, there are overlapping ages of eligibility among the Leagues, with differing levels of play expected in some cases. This allows a comparison across leagues of players of the same age. According to the relative age hypothesis, a higher calibre league would be expected to have a greater proportion of its players born in the earlier months of the year than a league comprising individuals playing at a lower skill-level. The results of the analyses of birth-quarter data

in this vein are shown in Table 2. Overall, the results provide some support for the relative age hypothesis, but apart from the comparison of totals, only the analysis for 12-year olds reached statistical significance. The results for the 12-year olds are shown in Figure 2.

Table 2. Comparison of the effects of relative age across leagues with age held constant

Age/ Leag.	Number of Players				X ²	Sig
	Birth Quarter					
	Q1 Aug- Oct	Q2 Nov- Jan	Q3 Feb- Apr	Q4 May- Jul		
10 Yrs Minor/ Major	85 12	67 8	84 7	85 8	1.39	NS
11 Yrs Minor/ Major	29 107	19 93	26 76	31 66	7.11	NS
12 Yrs Minor/ Major	8 103	6 105	15 81	20 94	11.89	.01
13 Yrs Senior/ Junior	31 77	31 46	48 55	35 61	7.47	NS
14 Yrs Senior/ Junior	53 4	51 3	46 7	57 9	3.32	NS
Total Lower/ Higher	206 303	174 255	219 226	228 238	13.09	.01

Relative Age and Tournament Play

At season's end the more accomplished players from the Major, Junior, and Senior Leagues are selected for post-season tournament play. According to the major hypothesis of this paper, these players, in comparison to their age-mates not selected for post-season play, should tend to be born toward the beginning of the "baseball year". The distributions across birth-quarters for tournament and non-tournament players are shown in Table 3. Overall, there is a statistically significant difference between the birth-quarter distributions of tournament players

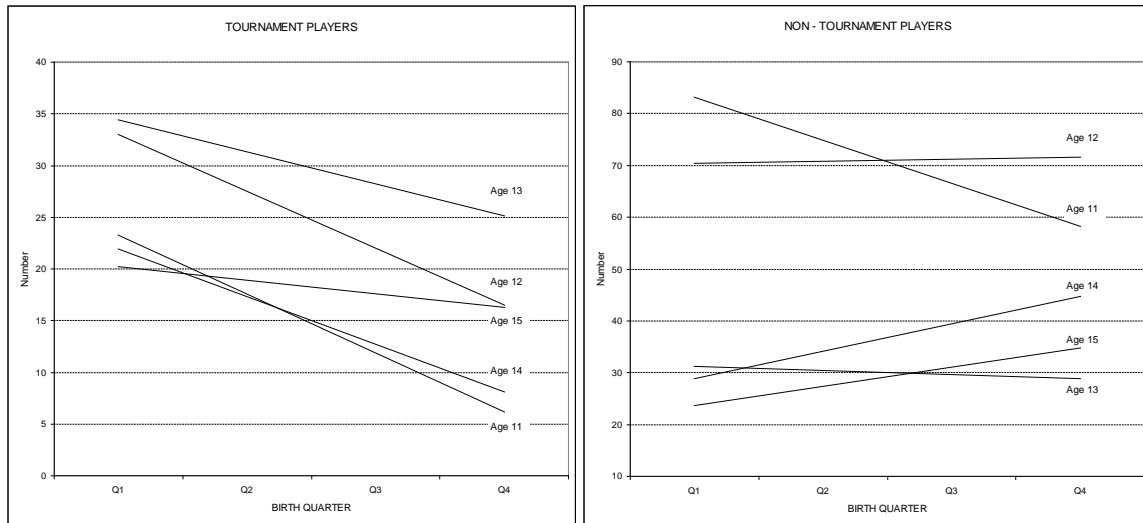
and those not selected for tournament play. A statistically significant effect was also found for those aged 13, 14, and 15 years, with values approaching significance ($p < .10$) for those aged 11 and 12 years. However, the differences found do not precisely correspond to that suggested by a relative-age

Table 3. The distribution across birth-quarters for tournament and non-tournament players

League - Age	Number of Players				X ²	Sig
	Birth Quarter					
	Q1 Aug- Oct	Q2 Nov- Jan	Q3 Feb- Apr	Q4 May- Jul		
Major 11						
Tournament	21	21	12	5	6.72	NS
Non-Tour.	86	72	64	61		
Major 12						
Tournament	31	31	21	16	5.53	NS
Non-Tour.	72	74	60	78		
Junior 13						
Tournament	34	28	36	21	14.39	.01
Non-Tour.	43	18	19	40		
Senior 14						
Tournament	21	20	10	9	11.50	.01
Non-Tour.	32	31	36	48		
Senior 15						
Tournament	18	24	14	17	8.24	.05
Non-Tour.	28	19	35	35		
Total						
Tournament	125	124	93	68	22.06	.001
Non-Tour.	261	214	214	262		

hypothesis. Figure 3 shows the linear "lines of best-fit" corresponding to the data presented in Table 3. Note that the results for those involved in tournament play reflect the expected decline from first to last quarter (ratio overall = 2:1). However, the trend-lines for non-tournament players do not show a consistent pattern. In fact, the overall results for those not selected for tournament play reflect a "U-shaped" function, when an increase from first to last quarter might have been expected.

Figure 3. Linear trends of the birth-quarter distributions of tournament and non-tournament players



DISCUSSION

As noted earlier, the expected consequences of a robust relative age effect would be (1) a higher drop-out rate among those younger than other children in the same age-grouping, and (2) better performance by those older than others in the same age-grouping. In this light, relative age does not appear to be a significant factor in Little League Baseball. Although a large proportion of children appear to have dropped out of Little League Baseball at the beginning of their

teen years, no evidence appeared here that indicated that this could be ascribed to differences in relative age. It would seem that reduced participation within the older age-groupings could be better thought of as being a result of the influence of changes in age-related factors such as social interest, economic priorities, and competition from other sporting activities in the teen years.

This study provides evidence of an association between relative age and level of athletic performance which is of a much lower magnitude than that found in investigations of other activities. Basically, relative age seems to be limited to particular age groups selected for tournament play. Thus, relative age advantages in Little League Baseball are restricted and short-term.

The results of this study suggest that the weak relative age effect found in Major League Baseball¹² (in comparison to other sports) is a logical consequence of the limited effect at the Little League level. The disparity between baseball and other sports in this regard cannot be explained with certainty from the data examined in the present study. A possibility, however, is that the small relative age effect is a consequence of the size of the age-range used when grouping children in Little League Baseball. As noted above, the age-ranges used in Little League Baseball are much greater than those used within minor hockey or soccer. For example, the span is four years for T-Ball, and five years for Minor League. Thus, all players are at a considerable relative age disadvantage when they enter Little League Baseball, and they are likely to be faced with this reality for some years to come. That is, the possible one-year difference in ages among the beginning players is relatively small in comparison to the potential four- or five-year advantage of the older non-rookies. This leads to the fascinating conjecture that the use of highly heterogeneous age groupings may neutralize the relative age effect. This is in contrast to a number of previous suggestions that the use of restricted age groupings should be adopted in order to reduce the effect of relative age.¹³

If the above speculation proves to have some merit, the sobering possibility should be considered that it may be that the large age-span produces an advantage to no-one, while the narrower range used in other sports results, at least, in a fortunate few feeling the beneficial effects of relative age. The manner in which this issue is resolved depends, of course, on the importance placed on the development of maximum performance. If performance counts, we need to determine whether it would be better to learn to "harness" relative age effects or to neutralize them. If the latter is the case, then Little League Baseball may have provided us with an appropriate model for the organization of youth sports programs.¹⁴

Endnotes

1. Barnsley, R. H., Thompson, A. H., & Barnsley, P. E. (1985). Hockey success and birthdate: The relative age effect. *Canadian Association for Health,*

Physical Education, and Recreation Journal, 51, 23-28.

Barnsley, R. H., Thompson, A. H., & Legault, P. (1992). Family planning football style: The relative age effect in football. *International Review for the Sociology of Sport*, 27(1),77-88.

Thompson, A. H., Barnsley, R. H., & Stebelsky, G. (1991). "Born to play ball": The relative age effect and major league baseball. *Sociology of Sport Journal*, 8, 146-151.

Grondin, S., Deshaies, P., & Nault, L. P. (1984). Trimestres de naissance et participation au hockey et au volleyball. *La Revue Qu,becoise de l'Activit, Physique*, 2, 97-103.

2. Op. cit., Barnsley, Thompson, & Barnsley (1985)
3. Barnsley, R. H., & Thompson, A. H. (1988). Birthdate and success in minor hockey: The key to the NHL. *Canadian Journal of Behavioral Science*, 20, 167-176.
4. Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, 84, 191-215.
5. Rosenthal, R. & Jacobson, L. (1968). *Pygmalion in the classroom: Teacher expectation and pupils' intellectual development*. New York: Holt, Rinehart & Winston.
6. Op. cit., Barnsley, Thompson, & Legault (1992).
7. Daniel, T. E., & Janssen, C. T. L. (1987). More on the relative age effect. *Canadian Association for Health, Physical Education, and Recreation Journal*, 53, 21-24.
8. Op. cit., Thompson, Barnsley, & Stebelsky (1991).
9. Ibid.
10. Little League Baseball, Inc. (1990). *Little League Baseball: Official regulations and playing rules*. Williamsport, PA: Author.
11. Op. cit., Barnsley & Thompson (1988).
12. Op. cit., Thompson, Barnsley, & Stebelsky (1991).
13. Op. cit., Barnsley & Thompson (1988).
 Boucher, J., & Halliwell, W. (1991). The Novem System: A practical solution to age grouping. *Canadian Association for Health, Physical Education, and Recreation Journal*, 57, 16-20.
 Op. cit., Thompson, Barnsley & Stebelsky (1991)
14. The authors wish to acknowledge the support of Joe Shea, President of Little League Baseball Canada. We wish to extend special thanks to Marthe Dubroy, also of Little League Canada, for her work in assembling the data and for her advice.