

Improving learning progress in a mind sport game

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Abstract. We show that tournament participation accelerates the growth of playing strength for children and teenagers in the mind sport game Go (also known as Weiqi or Baduk). Studying a sample of all participants of the 2013 German Youth Go Championship and their subsequent performance, we also control for various other possible causes. Furthermore, we find that tournament participation can be efficiently increased with special children competitions like the German “Kids-and-Teens Trophy”. To this aim we analyze data of all participants on this competition since 2003, leading to a total of nearly 1000 observations.

1 Introduction

In this article we want to study what factors enhance the learning progress in a mind sport game. We study this on the example of the Asian board game “Go”, also known as “Weiqi” or “Baduk”. We do not want to compare teaching methodology or teaching contents in our study, but rather take a broader view, since not only the way how strategies and tactics in a game are taught influences the progress of players, but also multiple other factors – either directly (training, playing games etc.), or indirectly (via increasing motivation).

We are also not concerned about improvement that ultimately will lead to reaching a professional level. We are more concerned about broader education of particularly young players who are needed to sustain or expand the normal population of players. In this context it is vital for any mind sport, but actually for any sport regardless whether it is a mind sport or a classical athletics sport, that enough young people will pick up this sport *and* continue it throughout their adult life. In particular in mind sports where it is fairly easy to check the progress a player makes via a well calibrated rating system (like in Go), it

is important that already children steadily become stronger, since stagnating levels might lead to demotivation and increase chances that children drop out of this mind sport altogether. Evidence for this can be seen in studies on certain sports that show that children who are relatively older in their respective age class are more likely to continue pursuing the sport, because they are – just based on their more advanced physical development – stronger and more successful than their slightly younger peers [3].

From a strategic point of view it is therefore very important to know the factors that improve the rate of progress children make in Go, since only by improving this rate, the drop out ratio can be reduced and a larger number of children will continue to play Go as adults and finally can teach the game again to children.¹ The alternative approach is simply to teach a larger number of children Go, so that a high drop out ratio still leaves enough players to play Go up to their adult life. It will, however, not be possible to implement this alternative approach in a country without a strong tradition for Go, since the number of beginners will always be limited by the number of Go teachers who actively recruit children and teach them. This is a difference to cases where certain mind sports (or athletic sports) are widespread in a population: e.g. in Germany minimizing the drop out ratio is not of such a vital importance for soccer clubs who always have a large pool of young children starting to play soccer. In China or South Korea the same principle might apply to Go: there always a large number of children starts and therefore a minimization of the drop out ratio is not the highest priority – although of course not entirely irrelevant, too.

In this paper we will study two questions empirically using a data set of participants of the German youth championship in the year 2013. The first ques-

¹Improving in go seems to be important for adult tournament players, as well. [4] finds, e.g., that “competence mastery” for participants of major go events, like the European Go Congress, is the second most important reason for participation.

tion is what factors helped the children to improve their strength in Go. The main result (Section 2) will be that participating in more tournaments seems to be a key factor. The second question is how to increase tournament participation. In Section 3 we present a concept that has been used in Germany in the last years to increase tournament participation of children and teenagers and to measure its success. While we obtain our results for Go playing children in Germany, many of these results are likely to carry over to other mind sports and of course to other countries.

2 What factors help to improve in Go?

For our data analysis we use different data sources. The starting point for the analysis is a survey that has been conducted among all participants of the German Youth Go Championship in the year 2013 ($N = 36$)². In this questionnaire (see Appendix A) we asked the participants a number of questions regarding when, where and how they learned Go, how often they study, how often they play games, about their knowledge on ways how to learn Go or where to play Go (e.g. about internet Go servers) and various other questions. As secondary data we used the data base of the European Go Federation that includes all results of all Go tournaments played in Europe since the early 1990s. This data base has been used to count the tournament participation of the children and also to measure their playing strength as the data base includes a so called GoR (Go Rating) score on a scale starting at 100 points (corresponding to a European level of 20 kyu or worse).

100 GoR points more correspond to 1 traditional rating level. Therefore a level of 2100 GoR points corresponds to the first dan. Finally, we use as secondary data the results from the Kids and Teens Pokal (Kids-and-Teens Trophy), which is available online on the webpage of the German Go association (DGoB) and will be described further in section 3.

In a first analysis we want to test a number of possible factors that might induce an improvement

of playing strength (as measured via the GoR score). The following factors were studied:

- The number of tournaments the child played in the years 2013 and 2014, according to the EGF database.
- How much knowledge the child had about various competitions and learning resources for Go that had been measured in the questionnaire.³
- The self-reported frequency how often did the child play Go on a five point scale: (nearly) every day, several times per week, once per week, once a month, rarer.
- The self-reported frequency how often the child studied Go on the same five point scale.
- Whether or not the child played Go online
- Whether or not the child had been taught Go by one of its parents (The reasoning behind this was that having a Go playing father or mother might increase the chances of being taught more intensely and also obtaining more general support).

In a first analysis, we checked the correlations between the GoR improvement from the beginning of 2013 to the beginning of 2015 with these factors.⁴ The number of tournaments in which the child participated was hereby transformed via the logarithm since the numbers had a very high skewness (many children participated in very few tournaments while a few participated in many tournaments). The correlation results are shown in Table 1.

	GoR Improvement
Log(Tournaments)	0.427***
Knowledge	0.184
Frequency of playing	0.293*
Frequency of learning	0.187
Plays go online	0.258
Taught by parents	0.020

Table 1: Correlations with GoR improvement 2013 until beginning of 2015

*(**, ***) significant at 10% (5%, 1%) level; t-values in brackets

²The participants represent approximately a third of all young German players that play at least with 20 kyu. – In Go, playing strength is traditionally measured in student levels (kyu) and master levels (dan). There are additional professional dan levels that we do not have to consider in the study. A beginner starts with a high kyu level that, depending on the definition, is sometimes set at 30 kyu, sometimes at 40 kyu, sometimes even at 100 kyu. A player who is participating in tournaments in Europe (for adults) is usually considered to be at least 20 to 25 kyu. An average tournament player plays with around 6-7 kyu, and above 1 kyu, the dan level starts with the lowest dan level being 1 and the highest usually being 7, sometimes 8 dan. The German champion, for example, plays with 6 dan. The strongest European amateur players are 7 dan.

³We gave one point each for knowing one of 14 topics regarding Go, see the questionnaire in Appendix A for the full list.

⁴See Appendix B for the playing strength development of the participants.

Independent variables	GoR improvement (EGF database)				
Constant	-11.967*** (-3.230)	-12.811*** (-3.674)	-11.979*** (-3.191)	-14.653*** (-3.215)	-351.452 (-0.491)
Log (tournaments)	3.710*** (2.751)	5.212*** (3.699)	3.795*** (2.735)	3.248** (2.249)	3.832*** (2.760)
Years playing go		-1.188** (-2.403)			
Taught by parent			-1.080 (-0.352)		
Frequency of playing				0.924 (0.704)	
Frequency of learning				0.191 (0.203)	
Year of birth					0.170 (0.474)
N	36	36	36	36	36
Adjusted R^2 (%)	15.8	26.2	13.6	13.7	13.8

Table 2: GoR improvement from 2013 to beginning of 2015

*(**, ***) significant at 10% (5%, 1%) level; t-values in brackets

We found a highly significant effect of tournament participation⁵, while we found no statistical significance of knowledge, learning frequency and whether or not the child played Go online. In all of these cases the coefficients were, however, positive, so that it seems plausible that a larger sample size could lead to a significant result. The coefficient for whether or not the parents had taught Go to a child was close to zero, and the only other mildly significant factor was the frequency of how often the children played Go.

To study these effects more in detail, we performed a linear regression analysis (Table 2) where we used various sets of control variables to check robustness, but the tournament participation stayed highly significant when correcting for the birth year of a child (expecting that older children might improve faster and at the same time might attend more tournaments), the frequency of playing Go, the learning frequency, whether or not the parents play Go and finally the number of years the child had played Go. The latter point (duration) was indeed also significant in that a child that had learned Go already some time ago did not improve that quickly any more, (which was to be expected). In all cases the regression model has also a reasonable R^2 value.

The results are also in line with [1] who found for

⁵It is important to point out that playing many tournaments is *not* a prerequisite for improving the GoR, since in Germany tournament players can increase their rank by themselves up to a level of 2 Dan, without the need to collect rating points at tournaments. Such a rating “update” is frequently used by young, quickly improving players.

adult chess players that the hours per week currently spent on tournament games, but also on studying seriously, were predicting factors for playing strength, particularly in younger subjects (age < 40).

Summing up the results, it seems that the number of tournaments visited was the most important factor contributing to a positive strength development of a child. This seems to be at odds with the concepts of [2] on learning that suggests “effortful studying” as the single most important contribution to an improvement in skills. An explanation might be when we consider that the learning effect of the tournament games themselves cannot provide such a learning effect as an easy estimate shows: Even children who participated in 20 to 30 tournaments in the two years of our observation period, where in each of these tournaments they played typically five games (the standard number of rounds for tournaments in Germany), played at most about 100 to 150 games at these tournaments. This in itself is probably not enough to explain a big difference in playing strength increase, given that many children play much more online games on a regular basis. (Even if a child on average plays only five online games per week that would already be a number that is a magnitude higher).

Here, effortful studying might occur in a way that children are not even aware of: tournament games are taken more serious and therefore tend to be analyzed afterwards. This may indeed lead to a better improvement in playing strength than just playing less serious

games. However, there might be other important factors, e.g. the social interaction at tournaments with other Go players that might lead to studying games together or simply to an increase of motivation to learn and to improve. It is, of course, beyond this study to find out which of these factors are most important. For practical implications, however, the key result is that motivating children to participate in a tournament looks like a very promising strategy to foster their progress.

3 How to increase tournament participation of children and teenagers?

Given the results of the previous section it seems natural to ask how to motivate children to participate in tournaments. There are a couple of reasons that make tournament participation for children outside East Asia tricky: First of all, since the density of Go player population is quite low, so is the number of Go playing children. This means that pure children tournaments are quite rare. This is in Germany, for example, in stark contrast to the situation in chess, where in many cities there are regular children chess tournaments. In Go, such regular tournaments are only located at relatively few places. We estimate the number of such tournaments to be between 10 or 20 per year for Germany as a whole. Hence, participating in a children tournament involves traveling longer distances. Moreover, once a child becomes a bit stronger (maybe 10 kyu or above), it will be difficult to find children of a similar playing strength. For all of these reasons it is natural to integrate children into adult tournaments. This is what typically has happened in Western countries for decades, and it is usual that even small children play in the same tournament and without handicap stones against adults (see Fig. 1).

There are some drawbacks to this: First of all some of the children might simply be reluctant or too shy to play with adults. Second, the children's performance is always being compared with the one of the adults. A child that plays with 20 kyu or 15 kyu might therefore participate in a tournament as the best participating child, but still ends up with seeing itself at the bottom of a long table of participants. Surely, not a motivating feedback!

To counteract these somehow demotivating factors, already in 2003 the German Go Association started the so called "Kids- und Teenspokal" (Kids-and-Teens Trophy). The idea of this competition is the following: Children under 12 years and all teenagers under 18 years in Germany automatically compete in this competition. For each participation



Figure 1: At tournaments in Europe, it is common to see smaller children playing among adults. (Here a photo from the European Go Congress 2012 in Bonn, Germany.)

of a child in any tournament, that has been announced by the German Go Association⁶, the child obtains 1 to 4 points depending on its performance (for a negative score, e.g. 1 win and 4 losses it will obtain 1 point, for an even score, e.g. 2 wins, 2 losses, it will obtain 2 points, and for positive scores it will obtain 3 points, unless the child won all games, which would give 4 points).

The scores of the participants are recorded on a web page and communicated via the bi-monthly publication of the German Go Association, the *Deutsche Go-Zeitung*, and at the end of the year prizes are awarded to the best participants in both age categories (50 € for the first prize, 30 € for the second, 20 € for the third prize and small commemorative items for the first 20 in each category.) The idea is to motivate children to participate in tournaments regardless of whether these are children or adult tournaments, and to reward them regardless of their actual playing strength.

Of course the question arises whether such a competition can actually motivate children to participate in more tournaments. In order to test this we collected the data of all participants in the Kids-and-Teens Trophy from 2003 to 2013 and combined them with their GoR rating as taken from the EGF data base. We tested whether knowledge about the Kids-and-Teens Trophy (as measured in our survey among the participants in the German Youth Go championship 2013) contributes to participation in more tournaments in the year before. Given that we made the children aware of the Kids-and-Teens Trophy by conducting the survey we could obviously not measure their tournament participation in the following year and assume that it would be influenced by their knowledge

⁶These includes basically all public tournaments in Germany and even some in neighboring countries.

Independent var.	Tournament participation in 2012				
Constant	0.519*** (2.965)	0.107 (0.566)	-11.091 (-0.148)	0.126 (0.601)	-0.028 (-0.146)
Knows Kids-and-Teens Trophy	1.365*** (5.813)	0.804*** (3.153)	0.803*** (3.097)	0.852** (2.550)	0.751*** (3.099)
GoR score		0.001*** (3.596)	0.001*** (3.091)	0.001*** (3.550)	0.001*** (4.077)
Year of birth			0.006 (0.149)		
Knowledge				-0.001 (-0.223)	
Taught by parent					0.537** (2.215)
N	36	36	36	36	36
Adjusted R^2 (%)	48.4	61.8	60.6	60.7	65.8

Table 3: Tournament participation in 2012 (the year before the survey)

*(**, ***) significant at 10% (5%, 1%) level; t-values in brackets

about the Kids-and-Teens Trophy. It turned out that the knowledge about the Kids-and-Teens Trophy was indeed highly significant for the number of tournaments played in 2012 (see Table 3).

This held true even after controlling for the GoR, the year of birth, the knowledge about other competitions and training programs or after controlling for whether or not the parents had taught them Go.

As expected the playing strength of the children as measured by GoR (taken from the EGF database) had also a significant influence on the number of tournaments visited, since stronger children on average attended more tournaments. It was interesting to see that whether or not the parents had taught the child Go had a significant impact on tournament participation as well. This is probably due to the fact that Go playing parents are simply more willing to drive their kids to tournaments at locations distant from their home town.

Of course this result cannot exclude a reverse causality (children who participated in many tournaments just had more chances to learn about the existence of the Kids-and-Teens Trophy) or common factors. While we controlled for a number of potential common factors in the regression analysis, it is not possible to exclude all such factors. The reverse causality, however, is a severe problem for our argument, and therefore we need stronger evidence for the effect of the Kids-and-Teens Trophy. If we assume that this competition has a motivating effect we would expect that this motivating effect becomes stronger after a child was successful in this competi-

tion. We therefore conducted a panel data analysis on all participants of the Kids-and-Teens Trophy since 2003 to check whether their result in the Kids-and-Teens Trophy influenced their subsequent tournament participation. More precisely, we looked at their rank in the competition in year t and compared it with the number of tournament participations in year $t+1$.

Table 4 shows the results of this regression analysis, where we control for a number of factors that might influence the tournament participation and at the same time their success in the Kids-and-Teens Trophy, in particular the playing strength of the children and their age and gender.

Since tournament participation is highly skewed, the first two columns use a Poisson regression, while the third and forth use a logarithmic regression. We also clustered by players to reflect the panel structure of our data (column two and four). Participants without tournament participation in year $t+1$ were excluded from the logarithmic regression, hence the number of cases was lower.

The results clearly show that a success in the Kids-and-Teens Trophy had a positive impact on subsequent tournament participation. This demonstrates that the idea of the Kids-and-Teens Trophy works. We can therefore recommend to introduce similar competitions in other countries in order to motivate children to participate in tournaments, which ultimately increases their playing strength, as we have seen in the last section, and therefore can reduce drop out ratios.

Clustered by player?	Tournaments in year t+1		Log(Tournaments) in year t+1	
	Poisson regression		Logarithmic regression	
	no	yes	no	yes
place in year t	-0.0128***	-0.0127***	-0.0048***	-0.0048***
age	-0.0401***	-0.0412***	-0.0269**	-0.0294**
gender	-0.298***	-0.295***	-0.243***	-0.237***
strength in t	0.0005***	0.0005***	0.000262***	0.0003***
improvement in t	0.0004***	0.0004***	0.0003***	0.0003***
tournaments in t	0.0483***	0.0478***	0.0537***	0.0534***
constant		1.330***	1.215***	1.251***
Inalpha constant		-3.607***		
N	978	978	633	633

Table 4: Tournament participation of Kids-and-Teens Trophy participants. The numbers are the coefficients of the corresponding regression models.

4 Conclusion

We have seen that tournament participation is a key factor to help kids to improve. While we cannot exclude that other factors are also leading to an improvement, we did not find them to be statistically significant in our sample. Thus, increasing tournament participation seems to be a relatively easy way to foster playing strength and consequently reduce drop out rates among young players. One way to motivate children to participate in tournaments is to introduce competitions like the Kids-and-Teens Trophy in Germany, which award points to successful participants and give prizes to the most successful children each year. Our results prove empirically that such a competition indeed increases tournament participation. We do not claim that the Kids-and-Teens Trophy is the most efficient or optimal way to achieve this goal, but we do recommend to use similar concepts in other countries, since to our knowledge there are no other methods that have been empirically proven to successfully motivate children to participate in tournaments.

There are some limitations to our approach, the strongest probably being the small sample size for studying the effect of tournament participation on playing strength. It would be interesting to enlarge this sample by replicating our study in other Western countries. The core results should hold in all countries with a somehow low density of Go players. We would expect to see very different outcomes in a country like China, South Korea or Japan, where the density of young Go players is much higher than in Germany. Our results might also be useful for other mind sports, in particular when the number of young players is rather limited.

References

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A Survey questionnaire

The relevant items from the questionnaire that has been answered by the participants of the German Youth Championship 2013 in Darmstadt (original in German):

Name:

City:

Birthday:

When did you learn go?

Where did you learn go?

- In school
- From parents
- From siblings
- From a go teacher
- On the internet
- In a book
- From a rule set of a go game
- Others:

How often do you play go?

- (Nearly) every day
- Several times per week
- Once per week
- Once a month
- Rarer

Are you regularly studying go to become stronger?

- Yes
- No, I only play games.

If yes, then how often?

- (Nearly) every day
- Several times per week
- Once per week
- Once a month
- Rarer

Which of the following items have you heard of?

1. Kids-and-Teens trophy
2. Hans-Pietsch Memorial
3. German Youth League
4. European Youth Championship
5. Go-Child
6. Hikaru no Go
7. Children corner in the German Go Magazin
8. Ratingen Tengen
9. In-Seongs Yunguseng Dojang
10. KGS plus
11. go4school
12. Hamburg Go-Seminar
13. Trier Tengen
14. Sensei's Library

B Playing strength of participants

Figure 2: Development of playing strength (as measured by GoR) of the participants of the German Youth Championship 2013 in the subsequent two years.

