Journal of Physical Education and Sport ® (JPES), Vol. 26 (issue 8), Art 149, pp. 1470 - 1476, August 2026
online ISSN: 2247 - 806X; p-ISSN: 2247 – 8051; ISSN - L = 2247 - 8051 © JPES

Original Article

Analysis of sport climbing athlete participation in Bulgaria from the first to the seventh age group for calculating the adolescent dropout rate

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Published online: August 31, 2026
Accepted for publication: August 15, 2026
DOI:10.7752/jpes.2026.08149

Abstract:
The study addresses a key issue related to athlete dropout and retention in youth sport climbing. The analysis examines age-related dynamics in physical development and psychological processes specific to adolescents, using official protocols from Bulgarian Cup sport climbing competitions for the period 2016–2025. The protocols were organized into a unified database and analyzed using descriptive statistics, gender comparison, trend analysis, and cohort analysis. The interpretation of the data reveals an uneven distribution of dropout across competitive age groups, with dropout during adolescence reaching approximately 50% in several transitions. A clear influx of new athletes is observed primarily from the first to the third age group, whereas the entry of new athletes into the older groups declines substantially. The results suggest that the number of adolescent competitors depends mainly on athletes who are attracted to and retained in sport at earlier ages, which may explain the smaller number of athletes who continue into the older age groups. The average duration of competitive participation identified in our study is approximately 2.5 years, with a median of 2 years, indicating that for most athletes, involvement in competitive sport climbing is relatively short-lived. Approximately 65%–70% of competitors stop participating within the first 2–3 years, while long-term retention (more than 6 years) is characteristic of only a very small group. The transition from youth categories to the adult men's and women's categories appears to be exceptionally rare. Analysis of official sport climbing competition records revealed a correlation between patterns of dropout and recruitment in the sport and the age-related characteristics and social changes specific to adolescents. These factors were used to support and interpret the findings. The interpretation of the data may also serve as a starting point for broader, more comprehensive future research on athlete dropout and recruitment in sport among adolescents in general. During the study, additional directions for future research were identified, such as the influence of sporting success on long-term retention in the sport, which was beyond the scope of this investigation.
Keywords: climbing, competitive climbing, age-related dynamics, sport dropout, athlete retention, youth sports

Introduction

Sport climbing has developed rapidly over the past decade, as reflected in the growing number of clubs, competitions, and athletes. However, observations from practice and competition protocols reveal an uneven distribution of children and adolescents across age groups. Participation is higher among the youngest children, up to approximately 10 years of age, and then declines in the early teenage years. This period is often associated with dropout, shifting interests, reduced motivation, stress, injuries, and the influence of external factors such as family, peers, and school. The high number of child and youth athletes compared with those who move on to the men's and women's categories is not unique to sport climbing. It is also observed across many other sports. More broadly, this is a fundamental issue in sport overall. In this study, our main objective was to reveal the dynamics of athlete dropout, retention, and recruitment in sport climbing. Understanding this process could help us more effectively target efforts to retain adolescents in sport and increase the number of athletes who advance to the men's and women's categories. Achieving this may require changes to the organization and management of the training and competitive process. The Bulgaria Cup is the main national competition circuit in which children and youth athletes from the first through the seventh age group participate, along with competitors in the men's and women's categories.

The transition between age groups appears to be associated with a higher risk of dropout. The period from the fourth to the seventh age group, approximately 13–19 years of age, is especially sensitive because it coincides with adolescence and puberty, when considerable physical, psychological, and social changes occur. During this stage, new interests emerge, the competition between academic commitments and sport becomes more pronounced, and adolescents experience greater pressure, stress, fluctuations in self-esteem, and changes in their social relationships. This study examines the dynamics of retention and dropout across age groups in Bulgarian Cup sport climbing competitions through an analysis of available official protocols for the period 2016–2025. The analysis was based on official competition records involving 936 sport climbing athletes, who

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were the subjects of this study. The aim of the study was to analyze the dropout rate in competitive activity during adolescence, based on data from the Bulgarian Cup sport climbing competitions for the 2016–2025 period. The working assumption was that dropout is not evenly distributed across age groups, but increases during adolescence, especially during the transitions between the fourth, fifth, sixth, and seventh age groups.

Materials and methods

Theoretical background: age-related characteristics of adolescents in sports

According to Zhelyazkova-Koinova, the period between ages 12 and 18 is critical for developing motivation, commitment, and persistence in sports participation. During these years, fundamental personality structures are formed, shaping attitudes toward success, volitional qualities, the perception of challenges, and relationships with coaches and teammates. Adolescence (approximately 12–18 years of age) is characterized by profound biological, cognitive, emotional, and social changes (Simpson, 2004) that influence how young people think, learn, make decisions, and participate in sports. Recognizing these developmental characteristics is crucial for research on athlete retention and dropout, especially in sports such as climbing, where physical demands, perceived risk, social interaction, and self-regulation play a central role (Zhelyazkova-Koinova, 2002).

Cognitive development: the progression from concrete to abstract thinking

According to Piaget's theory of cognitive development, adolescents enter the stage of formal operations, during which they develop the capacity for abstract, hypothetical, and logical reasoning (Piaget, 1996). Simpson (2004) further reports that between the ages of 12 and 18, young people progressively develop the ability to think conceptually rather than only concretely, understand cause-and-effect relationships, consider alternative perspectives, and anticipate the consequences of their actions (Zhelyazkova-Koinova, 2002).

However, younger adolescents (12–14 years) are still influenced by what Perry (1970) described as dualistic thinking, a tendency to perceive the world in terms of "right versus wrong," "black versus white," or "success versus failure." In sport, this may lead young climbers to interpret unsuccessful performances as evidence that climbing "is not for me," rather than recognizing failure as a natural part of the learning process.

Between the ages of 15 and 18, cognitive flexibility increases significantly, along with a greater capacity for comparative analysis and the consideration of multiple viewpoints (Commons & Richards, 2003). This developmental progression allows adolescents to respond more constructively to coaching feedback, manage risk more effectively, and adopt more advanced approaches to planning and long-term athletic development.

Social development: the role of peers in identity formation

According to Erikson (2013), adolescence is the developmental stage during which personal identity develops. Key characteristics of this period include the increased importance of peer relationships, a strong need for acceptance, status, and social approval, heightened sensitivity to evaluation by others, questioning of parents and other authority figures, and a growing desire for belonging and participation in group activities.

Among adolescents aged 12–14, the need for self-affirmation through peer relationships is especially pronounced, while older adolescents (15–18) increasingly seek more genuine interpersonal relationships and a stable social identity.

In the context of sport climbing, these developmental characteristics indicate that team dynamics, the social climate in the club, and the coaching style become key determinants of athlete motivation and long-term participation. Peer rejection, interpersonal conflicts, or inadequate social support may substantially increase the likelihood of dropout. In contrast, a strong sense of belonging to the training group serves as an important protective factor against sport dropout.

Physical development

Physical development between the ages of 12 and 18 includes rapid growth, sexual maturation, changes in proprioception, fluctuations in coordination, and heightened sensitivity to body image. In sports with high technical demands, such as climbing, young athletes must master more complex movements, cope with increasing loads, and maintain accurate coordination despite changes in body proportions. Awareness of their own physical strength, endurance, and appearance can contribute to higher self-esteem, greater self-confidence, increased vitality, and a more positive body image. In contrast, perceptions of physical weakness, falling behind peers, or dissatisfaction with one's body image are often linked to social withdrawal, insecurity, pessimism, and a greater risk of dropping out of sport (Mangan et al., 2024). According to Vidinovski (2014), the training process should foster both emotional engagement and a high level of involvement while avoiding excessive early specialization. In summary, adolescence marks a transition from physiological maturity to social maturity. Therefore, this developmental stage should be regarded not only as a time for achieving athletic performance but also as an opportunity to promote personal growth, self-confidence, and resilience in young athletes. International research views sport dropout as a complex process in which demographic, psychological, and contextual factors jointly shape young athletes' decisions to stop participating in organized sport. Nielsen et al. (2024) offer valuable empirical evidence through a prospective cohort study examining athlete retention and dropout among adolescents participating in organized sports. Their findings highlight that dropout is shaped not only by structural factors, such as age category or competitive demands, but also by psychological and social conditions. Although motivation itself is not examined directly, sport dropout should be understood as the result

of a complex interaction among athlete characteristics, opportunities for continued participation, and organizational factors, all of which have been systematically examined in studies such as Nielsen et al. (2024).

Recent research on youth athlete development also highlights the importance of distinguishing among chronological age, biological maturation, and sport specialization. In the review Youth Athlete Development: Critical Insights, Hangu et al. (2025) argue that growth and maturation during adolescence occur at different rates across individuals, which challenges the use of uniform training and competition requirements for athletes of the same chronological age. The authors suggest that early specialization and intensive competition schedules may lead to physical overload, psychological burnout, and premature withdrawal from sport. The review also emphasizes that transitions between age categories often coincide with periods of accelerated growth and increased performance demands. Therefore, the findings of Hangu et al. (2025) provide a strong theoretical basis for this study by underscoring the need for quantitative analyses of transitions between successive age groups and for identifying the developmental stages associated with the highest risk of athlete dropout.

Based on these theoretical considerations, it is hypothesized that dropout from sport climbing in Bulgaria is not evenly distributed across age categories, but instead rises substantially during adolescence, particularly during the transitions between age Groups IV, V, VI, and VII (approximately 12–19 years of age). This pattern is expected to explain the considerably smaller number of athletes competing in the older age categories compared with the younger groups.

The aim of this study was to examine the dropout rate from competitive sport during adolescence by analyzing participation data from the Bulgarian Cup sport climbing competitions held between 2016 and 2025.

Methodology and data source

The study used official competition protocols and rankings from the Bulgarian Sport Climbing Federation for Bulgarian Cup competitions during the 2016–2025 period. The database included all competitive age groups, from group 1 to group 7, as well as the male and female senior categories where available. The analysis focused on children and adolescents in groups 1–7, while the senior category was used only to interpret the transition to adult-level competition.

Research methods

The study was based on a review of the scientific literature and an analysis of the official Bulgarian Cup competition records published by the Bulgarian Federation of Climbing and Mountaineering (BFCM). A documentary analysis was performed using official competition results and rankings from the Bulgarian Cup series for the period 2016–2025. These records were treated as the primary empirical data source, providing objective information on athletes' participation across years and age categories.

The collected data were analyzed using appropriate statistical methods, including:

- Descriptive statistics: frequencies, percentages, and distributions by age group, year, and sex, as well as measures of central tendency and variability (e.g., mean duration of competitive participation);
- Sex-based comparative analysis: a comparison of retention and dropout rates among male and female athletes;
- Trend analysis: assessment of temporal changes in participation over the study period and evaluation of trends that may be used to forecast future participation;
- Cohort analysis: defining athlete cohorts by year and age category, with retention measured by the reappearance of the same athlete in the subsequent age category after the appropriate time interval;
- Correlation analysis: assessment of the relationship between the duration of competitive participation and competitive performance (ranking) to determine whether sporting success is associated with longer competitive careers and a lower probability of dropout.

Results

Overall number of participants by year

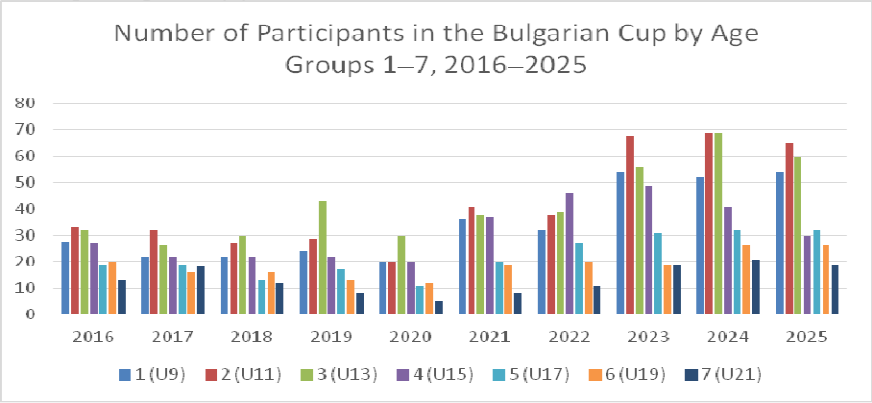

Fig. 1. Number of children and adolescents in the Bulgarian Cup groups 1–7, 2016–2025

Figure 1 shows the change in the total number of participants in groups 1–7 over the ten-year period. The graph shows a substantial increase in the number of athletes during the final three years of observation, indicating growing interest in sport climbing. This growth is especially evident in the second and third age groups, where many children typically begin competitive climbing. (https://bfka.org/ -….).

Distribution by age group and gender

A descriptive analysis of participation across all youth age groups was performed to evaluate trends in retention and dropout during adolescence. Tables 1 and 2 present the number of boys and girls participating in the Bulgarian Cup competition, respectively, by age group and year.

Table 1. Number of boys and adolescent male athletes in the Bulgarian Cup groups 1–7, 2016–2025

Group	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
U9	12	13	9	15	9	17	16	29	30	33
U11	16	17	16	13	6	22	22	36	32	29
U13	15	12	14	16	14	13	12	26	33	29
U15	15	8	10	9	10	15	22	22	13	9
U17	13	13	7	8	4	12	11	15	16	19
U19	12	10	9	7	9	11	11	9	12	11
U21	7	11	7	5	4	5	7	14	15	14
TOTAL	90	84	72	73	56	95	101	151	151	144

Table 2. Number of girls and adolescent female athletes in the Bulgarian Cup groups 1–7, 2016–2025

Group	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
U9	16	9	13	9	11	19	16	25	22	21
U11	17	15	11	16	14	19	38	32	37	36
U13	16	14	16	27	16	25	27	30	36	31
U15	12	14	12	13	10	22	24	27	28	21
U17	6	6	6	9	7	8	16	16	16	13
U19	8	6	7	6	3	8	9	10	14	15
U21	6	7	5	3	1	3	4	5	6	5
TOTAL	81	71	70	83	62	104	112	145	159	142

The data indicate a clear increase in competitive activity after 2019, with peak values in 2023–2025. The total number of athletes is relatively balanced by gender, but the distribution across age groups differs. Girls are generally more numerous in the third and fourth groups, while boys are substantially more numerous in the seventh group. Over the entire period under review, the largest share of all participations is concentrated in the 2nd (U11) and 3rd (U13) groups, each accounting for 21% of the total number of competitors. This means that over 40% of all participations are concentrated in the approximately 9–12-year-old age group, clearly establishing this stage as the main entry point to competitive sport climbing in Bulgaria. They are followed by the 1st group (U9) with 17%, confirming the trend of children entering the sport early, although on a more limited scale compared to the slightly older age groups. From the 4th group (U15) onward, a consistent and systematic decrease in the number of competitors is observed: 4th group (U15) – 15%, 5th group (U17) – 11%, 6th group (U19) – 9%, and 7th group (U21) – 7%. This structure clearly shows that as age increases and competition demands grow, the number of active participants declines, with the decrease being especially pronounced after the onset of puberty. During the observed period, there were no major differences in the total number of competitors between the two genders. Figure 2 shows the distribution by gender and age group in 2025.

Table 3. Average proportions by age group and gender for the period 2016–2025

Gender	G1	G2	G3	G4	G5	G6	G7
Girls	16%	20%	23%	18%	10%	8%	5%
Boys	17%	20%	18%	14%	11%	11%	9%

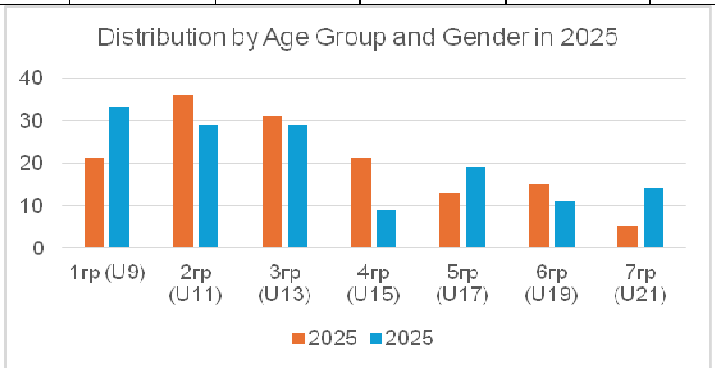

Fig. 2. Distribution by age group and gender in 2025

Estimating dropout during adolescence

For the first aggregated analysis, the data were divided into two groups: early groups (groups 1–3, approximately up to 11/12 years of age) and adolescent groups (groups 4–7, approximately 12/13 to 19/20 years of age). A retention coefficient was calculated as the relative share of participation in groups 4–7 compared with groups 1–3. The results are presented in Table 4.

Table 4. Retention and dropout coefficients for early groups (1–3) and adolescent groups (4–7)

Indicator	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	TOTAL
Athletes in groups 1–3 (A)	93	80	79	96	70	115	109	178	190	179	1189
Athletes in groups 4-7 (B)	79	75	63	60	48	84	104	118	120	107	858
Retention coefficient B/A	85%	94%	80%	63%	69%	73%	95%	66%	63%	60%	72%
Dropout coefficient = (B/A) − 1	−15%	−6%	−20%	−38%	−31%	−27%	−5%	−34%	−37%	−40%	−28%

At the aggregate level for the entire period, participation in groups 4−7 is approximately 72% of participation in groups 1−3. In contrast, this indicates approximately 28% lower participation in the older adolescent groups.

Cohort analysis of retention and dropout between age groups

Cohort analysis provides a more accurate picture because it tracks the same athletes by name. Table 5 shows the average dropout coefficients after two and four years by initial age group. The average values from the third group range from approximately −0.46 to −0.51 after two years, meaning that approximately half of the athletes do not continue to the next age group.

Table 5. Average dropout coefficients across age groups based on cohort analysis.

Initial group	Mean dropout after two years	SD after two years	Mean dropout after four years	SD after four years
U9	−0.41	0.11	−0.50	0.10
U11	−0.39	0.80	−0.55	0.11
U13	−0.46	0.10	−0.63	0.11
U15	−0.51	0.14	−0.64	0.10
U17	−0.49	0.11	−0.58	0.15
U19	−0.50	0.17	−0.81	0.10

The transition from the fourth to the fifth age group appears to be the most critical, with dropout coefficients exceeding 50% in almost all analyzed years. At the same time, the differences between the age groups are smaller than initially expected because most coefficients fall within a relatively narrow range.

Newly included athletes

The differences in dropout coefficients do not fully explain the uneven distribution of athletes across age groups. Therefore, the number of newly included athletes in each year and group was also examined. Newly included athletes were defined as those appearing in the competition database for the first time in a given year and group. Table 6 shows that most new athletes enter the system in the first and second groups, and that the proportion declines substantially in the older groups.

Table 6. Newly included athletes by year and age group.

Group	2017	2018	2019	2020	2021	2022	2023	2024	2025	Total	Mean	Proportion of all athletes in the group
U9	15	17	19	12	28	12	43	39	22	207	23	64%
U11	13	14	9	6	20	14	40	33	16	165	18	42%
U13	2	8	18	6	14	11	26	23	12	120	13	30%
U15	3	5	6	1	12	10	18	15	9	79	9	27%
U17	5	2	6	2	6	4	10	6	7	48	5	24%
U19	7	4	2	4	4	6	8	5	5	45	5	26%
U21	3	0	1	1	2	0	6	2	6	21	2	18%
TOTAL	48	50	61	32	86	57	151	123	77	685	76	

On average, 30% of all competitors in the 3rd group began their competitive careers in that year, with significantly lower proportions in the subsequent groups: 4th group – 27%, 5th group – 24%, 6th group – 26%, and 7th group – 18%. The table also shows that the highest number of competitors entered in 2023 and 2024,

with a total of 151 and 123 across all groups, respectively, while in 2025 the number of new competitors was significantly lower – 77, which can be explained by the change in age groups and the discontinuation of allowing children under 7 years of age to participate in the official Bulgarian Cup competitions. This suggests that adolescence is not a primary entry point into competitive sport climbing; rather, participation during adolescence depends largely on athletes who were already attracted and retained at younger ages.

Discussion

The results confirm that the total number of participants has increased in recent years, especially since 2019. However, this growth is mainly driven by a strong inflow of new athletes in the younger groups, rather than by long-term retention across the entire competitive pathway. Therefore, the age structure resembles a participation pyramid: many athletes enter the system in the early groups, while their number gradually declines in the older groups.

The cohort analysis supports the hypothesis that dropout is not evenly distributed across age groups. After the third group, dropout during transitions to the next age group increases to approximately 50%. The transition from the fourth to the fifth group appears particularly sensitive. This finding aligns with developmental perspectives that identify adolescence as a period of rapid biological, cognitive, social, and emotional change, as well as with studies suggesting that critical sport transitions may coincide with increased demands and a higher risk of dropout.

Gender patterns also warrant attention. Although the overall numbers of boys and girls are relatively similar throughout the period, girls are more strongly represented in the middle age groups, whereas boys predominate in the seventh group. This may suggest greater vulnerability among girls during late adolescence. Similar tendencies have been reported in youth sport research, where the dropout process is viewed as a combination of individual, social, and organizational factors rather than a single cause.

An important additional finding is that the uneven distribution across age groups cannot be explained by dropout alone. The analysis of newly included athletes shows that most new competitors enter in the first three groups, whereas the inflow into the older groups is substantially lower. Thus, the smaller number of athletes in groups 4–7 reflects both dropout and the limited entry of new athletes during adolescence.

Conclusions

Sport climbing in Bulgaria has a strong and growing base of early participation. However, the main challenge is not only attracting children to the sport, but also retaining them during adolescence and supporting their transition to older competitive age groups.

The dropout process becomes more pronounced after the third age group, with approximately half of the athletes not continuing through subsequent transitions. The transition from the fourth to the fifth group is the most critical in the analyzed data, although dropout remains high across all adolescent transitions.

The influx of new athletes is concentrated primarily in the first, second, and third groups. Beyond that point, the number of new competitors declines substantially, indicating that adolescent age groups rely mainly on athletes retained from earlier ages. These findings may help coaches, clubs, and the federation plan targeted retention strategies, adapt competitive formats, and identify age transitions where additional support is needed. The analysis of the duration of competitive careers further reinforces the conclusion that there is a high rate of attrition from competitive participation. The average duration of a competitive career was approximately 2.5 years, with a median of 2 years, indicating that participation in competitive climbing is relatively short-lived for most athletes. Approximately 65%–70% of competitors drop out within the first 2–3 years, while long-term retention (more than 6 years) is typical of only a very small share of participants.

The transition from youth categories to the men's and women's categories was exceptionally rare. Of the 936 athletes analyzed, only 39 advanced from the youth categories to the men's and women's categories over the last ten years, and by 2025 only 8 of these athletes were still actively competing. Most competitors in the men's and women's categories in 2025 either began competing at an older age or have a competitive history that extends beyond the period covered by this study.

Conflicts of interest

The authors declare that they have no conflicts of interest.

References

Bulgarian Federation of Climbing and Mountaineering (BFKA). Competition ranking data for the Bulgarian Cup. https://bfka.org/

Commons, M., & Richards, F. (2003). Four postformal stages. In J. Demick & C. Andreoletti (Eds.), Handbook of Adult Development (pp. 199-219). Springer.

Erikson, E. (2013). Identity: Youth and Crisis. Sofia: Riva. [Bulgarian edition].

Hangu, S., Hangu, C., & Manescu, D. (2025). Youth athlete development: Critical insights on training, testing, and specialization pathways. https://www.preprints.org/manuscript/202506.1785

Mangan, K., Andrews, K., Miles, B., & Draper, N. (2024). The psychology of rock climbing: A systematic review. Psychology of Sport and Exercise. https://doi.org/10.1016/j.psychsport.2024.102763

Nielsen, G., Wikman, J. M., Appleton, P. R., Bentsen, P., & Elsborg, P. (2024). Predicting adolescents' continuation in club sports: A prospective cohort study of the importance of personal and contextual motivational factors in five sports in Denmark. Scandinavian Journal of Medicine & Science in Sports. https://doi.org/10.1111/sms.14616

Perry, W. G. (1970). Forms of intellectual and ethical development in the college years. Holt, Rinehart and Winston.

Piaget, J. (1996). Psychology of intelligence. Pedagogika, VI(8), 3-100. [Bulgarian edition].

Simpson, A. R. (2004). Raising teens: A synthesis of research and a foundation for action. Center for Health Communication, Harvard School of Public Health / MIT.

Vidinovski, M. (2014). Specific features in the training of adolescent climbers. Scientific International Conference: 30 Years Faculty of Pedagogy, Veliko Tarnovo.

Zhelyazkova-Koynova, Z. (2002). Practicum in developmental psychology. Parts 1-2: Childhood. Adolescence. Sofia: Avangard.