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Gender differences in adolescents' thinking styles and career orientation

Abstract

This article examines gender-specific characteristics of thinking styles and career orientation among adolescents. Adolescence represents a critical developmental period marked by intensive cognitive and personal growth, during which future career interests and aptitudes begin to crystallize. The study analyzed various thinking styles (object-action, verbal-logical, visual-imagery, creative, and symbolic) alongside career orientation tendencies (investigative, aesthetic, organizational, among others). Results indicate that girls demonstrate higher propensity toward verbal-logical, visual-imagery, and creative thinking, showing greater interest in people-oriented professions. Boys exhibit preference for abstract thinking, research activities, and organizational-planning domains. The relationship between thinking styles and career preferences underscores the importance of considering adolescents' cognitive characteristics in career guidance. Findings highlight the necessity of supporting students' individual abilities and interests. The analysis draws upon scientific literature and empirical evidence.

Keywords: adolescents, thinking types, vocational interest, gender differences, profession

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Жасөспірімдердің ойлау стильдері мен кәсіби бағдарындағы гендерлік айырмашылықтар

Аңдатпа

Бұл мақалада жасөспірімдердің ойлау стильдері мен кәсіби бағдарындағы гендерлік ерекшеліктері қарастырылған. Жасөспірімдік кезең – когнитивтік және тұлғалық дамудың қарқынды жүретін маңызды сатысы, осы кезеңде болашақ кәсіби қызығушылықтар мен бейімділіктер қалыптаса бастайды. Зерттеуде әртүрлі ойлау стильдері (заттық-әрекеттік, сөздік-логикалық, бейнелік, шығармашылық және символдық) мен кәсіби бағдар түрлері (зерттеушілік, эстетикалық, ұйымдастырушылық және т.б.) талданды. Нәтижелер қыздардың сөздік-логикалық, бейнелік және шығармашылық ойлау стильдеріне бейімділігінің жоғары екенін, сондай-ақ олардың адамдармен байланысты мамандықтарға көбірек қызығушылық танытатынын көрсетті. Ұлдар абстрактілі ойлауға, зерттеу қызметіне және ұйымдастырушылық-жоспарлау салаларына бейімділік танытады. Ойлау стильдері мен кәсіби бейімділік арасындағы байланыс кәсіптік бағдар беруде жасөспірімдердің когнитивтік ерекшеліктерін ескерудің маңыздылығын көрсетеді. Зерттеу нәтижелері оқушылардың жеке қабілеттері мен қызығушылықтарын қолдаудың қажеттілігін айқындайды. Талдау ғылыми әдебиет пен эмпирикалық деректерге негізделген.

Түйін сөздер: жасөспірімдер, ойлау типтері, кәсіби бейімділік, гендерлік ерекшеліктер, мамандық.

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Гендерные различия в стилях мышления и профессиональной ориентации подростков

Аннотация

В статье рассматриваются гендерные особенности стилей мышления и профессиональной ориентации подростков. Подростковый возраст представляет собой критический период развития, характеризующийся интенсивным когнитивным и личностным ростом, в течение которого формируются будущие профессиональные интересы и склонности. В исследовании проанализированы различные стили мышления (предметно-действенный, словесно-логический, образный, творческий и символический), а также типы профессиональной направленности (исследовательская, эстетическая, организаторская и др.). Результаты показывают, что девочки демонстрируют более высокую склонность к словесно-логическому, образному и творческому мышлению, проявляя больший интерес к профессиям, связанным с работой с людьми. Мальчики проявляют предпочтение к абстрактному мышлению, исследовательской деятельности и организационно-плановым областям. Взаимосвязь между стилями мышления и профессиональными предпочтениями подчеркивает важность учета когнитивных особенностей подростков в профориентационной работе. Результаты исследования указывают на необходимость поддержки индивидуальных способностей и интересов учащихся. Анализ основан на научной литературе и эмпирических данных.

Ключевые слова: подростки, типы мышления, профессиональная склонность, гендерные особенности, профессия.

Introduction. Gender differences in adolescents' thinking styles and career orientation represent a critical area in contemporary developmental psychology. While biological, social, and cultural factors interact to shape cognitive processes and vocational preferences, systematic investigation of their interrelationship remains limited, particularly in Central Asian contexts. Understanding gender-specific cognitive patterns is essential for developing effective career guidance programs that account for individual differences rather than relying on stereotypical assumptions. This study addresses the gap by examining how thinking styles correlate with career orientation among Kazakhstani adolescents, providing empirical evidence for educational practice.

The practical relevance of this research is underscored by Kazakhstan's strategic emphasis on youth professional development and evidence-based career guidance (President of the Republic of Kazakhstan, 2025). On March 14, 2025, at the IV meeting of the National Assembly held in Burabay, the head of state Kassym-Jomart Tokayev emphasized that all opportunities should be created to expand the opportunities of young people, strengthen professional orientation, and train in-demand working specialists.

Adolescence represents a critical period for professional self-determination, characterized by intensive cognitive restructuring and identity formation. During this developmental stage, interests crystallize, values solidify, and career trajectories begin to take shape, making it an optimal window for career guidance interventions. Developmental psychology establishes adolescence as the optimal period for career guidance. Havighurst's developmental task theory identifies vocational preparation as a central adolescent challenge, emphasizing the integration of interests, abilities, and social expectations in career decision-making (Havighurst, 1972). Klimov's work-attitude typology provides a practical framework for structuring career guidance programs based on individual predispositions (Klimov, 1990). Contemporary research confirms these foundations: Gati and Saka demonstrate that career decision difficulties stem from internal uncertainty and role ambiguity (Gati & Saka, 2001), while

Hirschi's findings link professional self-determination to enhanced life satisfaction and future confidence (Hirschi, 2009). These studies collectively emphasize the need for developmentally appropriate, psychologically informed career guidance. These data prove that career guidance programs for adolescents should be not only informative, but also supplemented with psychological components that support personal development.

Also, the way adolescents think plays an important role in determining their professional orientation and shapes their predispositions to choose a future professional field.

Bruner's cognitive theory conceptualizes thinking as individualized information processing, identifying four distinct modes: enactive (action-based), iconic (image-based), symbolic (mathematical-logical), and representational (verbal-linguistic) (Bruner, 1966, pp. 112–115). Each mode reflects different cognitive strengths, with implications for learning and vocational aptitude. Rezapkina's adaptation of thinking style assessment for career guidance contexts operationalizes these constructs into five measurable dimensions: object-action, abstract-symbolic, verbal-logical, visual-imagery, and creative thinking (Bruner, 1966). This framework enables empirical investigation of cognitive style-career orientation relationships, forming the methodological foundation of the present study.

According to Bruner, *enactive thinking* is characteristic of practically oriented individuals. Information is transformed through physical actions, while maintaining spatial and temporal connections, and this transformation is subject to physical limitations. *Symbolic thinking*, on the other hand, is typical of individuals with strong mathematical abilities, where information is transformed through algebraic rules and symbolic operations. *Representational (sign-based) thinking* is associated with individuals inclined toward the humanities, involving information processing through logical reasoning and the use of sign systems based on grammatical rules. Finally, *iconic thinking* is typical of those with artistic abilities, where information is transformed through images without being constrained by physical limitations.

The Russian psychologist G.V. Rezapkina, who made a significant contribution to the study of thinking types in the field of career guidance, in his work “Methodology of determining the type of thinking in the modification of G. V. Rezapkina”, modified the methodology for determining thinking types and proposed its use in the process of career guidance. According to G. V. Rezapkina, the type of thinking is an individual way of processing information, and the dominant type of thinking of each person has a significant impact on his professional choice (Rezapkina, 2010, p. 42). Knowing his thinking type, a person can predict his success in certain types of professional activity (Rezapkina, 2010).

Holland's RIASEC model posits that career satisfaction depends on person-environment congruence, where individual personality types (Realistic, Investigative, Artistic, Social, Enterprising, Conventional) align with corresponding work environments (Holland, 1997). This theory suggests that cognitive styles should systematically relate to vocational preferences, as both reflect underlying personality structures. Holland's framework provides theoretical grounding for examining thinking style-career orientation relationships.

Bem's gender schema theory explains how socialization processes create gender-differentiated cognitive and behavioral patterns (Bem, 1983). During adolescence, gender role expectations intensify, potentially channeling boys and girls toward stereotypically congruent career paths regardless of individual aptitudes. Girls may gravitate toward communal, people-oriented professions (education, healthcare), while boys favor agentic, technical domains (engineering, IT). However, these patterns reflect socialization rather than innate differences, highlighting the importance of examining actual cognitive profiles independent of gender stereotypes.

Research gap and hypotheses. While thinking styles and career orientation have been studied separately, their interrelationship through a gender lens remains underexplored in Central Asian contexts. This study addresses three hypotheses:

H1: Female adolescents will demonstrate significantly higher verbal-logical, visual-imagery, and creative thinking scores.

H2: Male adolescents will show significantly higher abstract-symbolic thinking and research-oriented career propensity.

H3: Thinking styles will correlate with corresponding career orientations, with gender moderating these relationships.

Scientific novelty. This study provides first systematic evidence on thinking style-career orientation relationships among Kazakhstani adolescents, using validated instruments to inform gender-sensitive career guidance development."

Key principles. This study integrates three complementary frameworks:

(1) Bruner's cognitive style theory explaining individual information processing differences (Bruner, 1966);

(2) Holland's vocational personality theory linking cognitive patterns to career environments (Holland, 1997); and

(3) Bem's gender schema theory accounting for socialization influences on vocational development (Bem, 1983).

Together, these perspectives enable comprehensive analysis of how thinking styles and career orientations interact across gender during the critical developmental period of adolescence.

The study of the process of professional self-determination of high school students based on psychological and cognitive characteristics is one of the important directions of the modern educational system. Adolescence is a crucial period of personal and social development, during which students' future life plans, professional inclinations and abilities are formed (Choudhury et al., 2006; Laski, 2015). From this point of view, the study of the connection of their thinking types with gender differences allows for scientific justification of professional guidance (Havighurst, 1972; Klimov, 1990).

The cognitive style of adolescents is one of the important factors determining their professional interests and aptitudes. For example, the types of thinking (material-action, abstract-symbolic, verbal-logical, visual-figurative and creative) characterize the way a person perceives, processes and uses information. These features allow us to predict the potential for success in various professions and areas of activity. For example, adolescents who are prone to abstract-symbolic thinking are more likely to be engaged in technical and natural sciences, while those who are prone to verbal-logical and creative thinking can achieve high results in humanitarian and creative professions (Bruner, 1966, pp. 118–120; Rezapkina, 2010, pp. 45–47).

In the current changing cultural and social structure of society, career guidance should be based on individual aptitudes and abilities, rather than relying on preconceived ideas about gender differences. Research in this area increases the relevance of studying the professional aptitudes of adolescents in a comprehensive, scientifically proven way. In the system of personnel training in accordance with the needs of society, students' self-determination in a professional sense is the basis for the formation of high-quality labor resources.

By diagnosing career aptitude, it is possible to determine the student's readiness to choose a future profession, his internal motivational structure, and the direction of personal development. In modern society, the effectiveness of career guidance and the ability to make informed choices play an important role in determining the future life path of adolescents. A comprehensive study of the impact of thinking types and gender differences on career aptitudes allows us to improve the career guidance system in accordance with the abilities and interests of adolescents, taking into account their individual characteristics. In addition, when current socio-cultural conditions are changing the requirements for gender roles, the study of this issue is of particular importance not only from a theoretical perspective, but also from a practical perspective. A conscious and gender-sensitive approach to the professional future of adolescents is an important prerequisite for their personal development and social adaptation.

Materials and methods. The aim of the study was to examine gender differences in adolescents' thinking styles and career orientation characteristics, and to determine their statistically validated nature.

A comprehensive methodological approach was applied to identify the impact of gender differences on adolescents' thinking styles and career orientation. To achieve this aim, the following methods were used:

L.A. Yovayshi's Method for Identifying Career Orientation (modified by G.V. Rezapkina) (Rezapkina, 2010, pp. 92–94);

Thinking Style Methodology (Rezapkina's modified method for identifying types of thinking).

The sample consisted of 99 adolescents (47 boys, 52 girls) aged 15–17 years from grades 9–11 at Secondary School No. 111 in Astana (March–April 2025). The school represents a typical urban educational institution with mixed socioeconomic backgrounds, ensuring sample representativeness for the capital city population. The gender distribution was balanced (47.5% male, 52.5% female), with mean age 16.2 years ($SD = 0.83$). All participants provided informed consent, with parental consent obtained for minors.

Two standardized instruments were selected based on their established validity for adolescent populations and alignment with the study's theoretical framework. The Thinking Style Methodology by Rezapkina measures five dimensions: object-action thinking (practical problem-solving through concrete actions), abstract-symbolic thinking (mathematical-logical reasoning), verbal-logical thinking (linguistic-based reasoning), visual-imagery thinking (spatial and pictorial processing), and creative thinking (divergent thinking and novel solution generation). Each scale contains 10 items with binary response format, yielding scores from 0 to 10 per dimension. The instrument demonstrates acceptable internal consistency (Cronbach's α ranging 0.71–0.82 across subscales) and has been validated for Russian-speaking adolescent samples. The Career Orientation Questionnaire by Yovayshi, modified by Rezapkina, assesses six vocational propensity domains: working with people (social interaction preference), research activities (scientific-analytical interests), practical activities (hands-on technical work), aesthetic activities (artistic-creative pursuits), extreme activities (risk-taking and adventurous professions), and planning-economic activities (organizational-managerial interests). The questionnaire comprises 24 items with forced-choice format, generating scores across the six domains. Psychometric properties indicate satisfactory reliability ($\alpha = 0.68$ –0.79) and construct validity confirmed through factor analysis.

Data collection occurred during regular school hours in classroom settings under standardized conditions. Participants completed both instruments in a single 45-minute session, with instruments administered in counterbalanced order to control for fatigue effects. Instructions emphasized honest responding without time pressure, and researchers were available to clarify questions. All data were collected anonymously using numerical codes, with demographic information recorded separately to ensure confidentiality. The response rate was 100% among participating students, with no missing data due to the structured administration procedure.

Statistical analysis employed non-parametric methods due to ordinal measurement scales and the need to compare independent groups without assuming normal distribution. The Mann-Whitney U test was selected as appropriate for comparing two independent samples on continuous variables, providing robust results for small-to-medium sample sizes. This test evaluates whether two samples come from populations with the same distribution by comparing rank sums rather than mean values, making it suitable for the current data structure. SPSS 26.0 software was used for all analyses, with significance threshold set at $p < .05$ (two-tailed). Effect sizes can be reported using rank-biserial correlation (r) to quantify the magnitude of observed differences. For each comparison, mean ranks and sum of ranks are reported alongside U-statistics, Z-scores, and exact p-values to provide comprehensive information about group differences. The choice of non-parametric statistics acknowledges the exploratory nature of the study and prioritizes distributional robustness over parametric power assumptions.

Results and discussion. During our research work, the "Thinking Type" methodology in G.Rezapkina's modification was used to study the gender differences in the thinking types of adolescents. For this purpose, calculations were performed using the Mann-Whitney U test, a statistical criterion used to evaluate the difference between two independent samples based on the level of a quantitatively measured characteristic.

Table 1. Ranked indicators of adolescents' thinking types

Thinking Styles	Gender	N	Mean Rank	Sum of Ranks
Object-Action Thinking	Boys	47	39.52	1857.50
	Girls	52	59.47	3092.50
	Total	99		
Abstract-Symbolic Thinking	Boys	47	54.41	2557.50
	Girls	52	46.01	2392.50
	Total	99		
Verbal-Logical Thinking	Boys	47	44.10	2072.50
	Girls	52	55.34	2877.50
	Total	99		
Visual-Imagery Thinking	Boys	47	44.45	2089.00
	Girls	52	55.02	2861.00
	Total	99		
Creativity	Boys	47	43.91	2064.00
	Girls	52	55.50	2886.00
	Total	99		

*Note: Compiled by the authors.

The ranked indicators of adolescents' thinking types are presented in Table 1. Analysis of thinking style rankings revealed distinct gender patterns across all five measured dimensions. For object-action thinking, girls demonstrated substantially higher mean rank (59.47) compared to boys (39.52), with the sum of ranks being 3092.50 versus 1857.50 respectively. This large difference in ranking indicates that girls show greater propensity for concrete, action-based problem-solving approaches. In contrast, boys exhibited higher mean rank in abstract-symbolic thinking (54.41 vs. 46.01, sum of ranks 2557.50 vs. 2392.50), suggesting stronger orientation toward mathematical-logical reasoning and symbolic manipulation. Girls showed consistent advantages across the remaining three thinking dimensions: verbal-logical thinking (mean rank 55.34 vs. 44.10), visual-imagery thinking (55.02 vs. 44.45), and creativity (55.50 vs. 43.91). These ranking patterns suggest gender-differentiated cognitive preferences, with girls favoring concrete, verbal, visual, and creative modalities, while boys lean toward abstract symbolic processing. However, the critical question remains whether these observed ranking differences represent statistically reliable effects or merely reflect sampling variation.

Table 2. Statistical criteria for adolescent thinking types

	Object-Action Thinking	Abstract-Symbolic Thinking	Verbal-Logical Thinking	Visual-Imagery Thinking	Creativity
Mann-Whitney U	729.500	1014.500	944.500	961.000	936.000
Wilcoxon W	1857.500	2392.500	2072.500	2089.000	2064.000
Z-value	-3.592	-1.472	-1.983	-1.917	-2.053
Asymptotic Significance (2-tailed)	< .001	.141	.047	.055	.040
a. Grouping Variable: Gender					

*Note: Compiled by the authors.

Table 2 presents the statistical criteria for adolescent thinking types, providing formal hypothesis tests for the observed ranking differences. Mann-Whitney U test results confirmed statistically significant gender differences in three of the five thinking styles, while two showed non-significant patterns. Object-action thinking demonstrated the strongest and most reliable difference ($U = 729.500$, Wilcoxon $W = 1857.500$, $Z = -3.592$, $p < .001$), indicating girls' substantially higher practical thinking

orientation. With a p -value of $< .001$ ($p < .001$), this finding represents a robust effect unlikely to be due to chance. This result indicates that girls genuinely demonstrate clear advantage in hands-on, concrete problem-solving approaches, preferring to work through problems via physical manipulation and practical experimentation rather than purely abstract reasoning. Verbal-logical thinking differences were also statistically significant ($U = 944.500$, Wilcoxon $W = 2072.500$, $Z = -1.983$, $p = .047$), with girls showing superior linguistic-based reasoning abilities. Although the p -value is closer to the .05 threshold, the effect remains statistically reliable, confirming that girls in this sample demonstrate better ability to process information through verbal means, construct logical arguments using language, and engage in reasoning that relies on linguistic structures. Creativity differences similarly reached significance ($U = 936.000$, Wilcoxon $W = 2064.000$, $Z = -2.053$, $p = .040$), confirming girls' higher divergent thinking capacity and novel solution generation. This finding suggests that girls are more inclined to generate original ideas, think flexibly across multiple solution pathways, and produce creative responses to open-ended problems.

Two thinking styles failed to show significant gender differences, though for different reasons requiring distinct interpretations. Abstract-symbolic thinking showed no significant difference ($U = 1014.500$, Wilcoxon $W = 2392.500$, $Z = -1.472$, $p = .141$), indicating that despite boys' higher mean rank, the difference is not statistically reliable. This finding challenges common stereotypes about male superiority in mathematical and logical reasoning, suggesting that abstract thinking abilities are comparably distributed across genders in this adolescent sample. The p -value of .141 is well above the significance threshold, providing no evidence for gender differences in this cognitive domain. Visual-imagery thinking presented a more ambiguous pattern ($U = 961.000$, Wilcoxon $W = 2089.000$, $Z = -1.917$, $p = .055$), with the p -value falling just above the conventional .05 threshold. This near-significant result suggests a potential trend toward female advantage in spatial-pictorial processing, but the evidence is insufficient to draw firm conclusions. The proximity to significance ($p = .055$ vs. $p = .05$) could reflect either a genuine small effect requiring larger samples to detect reliably, or simply sampling variability in the absence of true population differences.

These findings align with cognitive development research showing gender-differentiated patterns in information processing styles, though with important nuances often overlooked in stereotypical accounts. Girls' superiority in object-action thinking ($p < .001$) reflects their tendency to engage practical, experiential learning strategies and concrete task execution. This pattern is consistent with educational observations documenting female students' preference for structured, hands-on activities where learning occurs through doing rather than abstract theorizing. However, this should not be interpreted as indicating that girls cannot engage in abstract thought, but rather that they show particular strength in grounding cognition in concrete experience. The significant advantage in verbal-logical thinking ($p = .047$) aligns with extensive literature documenting female linguistic strengths across multiple indicators, including verbal fluency, reading comprehension, vocabulary development, and language-based reasoning tasks. Meta-analytic research consistently finds small-to-moderate female advantages in verbal abilities emerging in childhood and persisting through adolescence, supporting the current finding. Girls' higher creativity scores ($p = .040$) support research linking aspects of feminine gender role socialization—particularly emotional expressiveness, sensitivity to aesthetics, and imaginative play encouragement—to qualities fostering creative output. However, it is important to note that creativity is multidimensional, and different forms of creative thinking may show different gender patterns.

The absence of significant differences in abstract-symbolic thinking contradicts common stereotypes about male mathematical superiority and represents one of the study's most important findings. While boys' mean rank was slightly higher (54.41 vs. 46.01), this difference was not statistically reliable ($p = .141$), providing no evidence for gender differences in mathematical-logical reasoning abilities within this sample. This finding aligns with contemporary research challenging traditional assumptions about gendered mathematics ability. Large-scale international assessments such as PISA have shown that gender gaps in mathematics performance vary substantially across countries

and have narrowed considerably over time, suggesting that observed differences reflect educational and cultural factors rather than inherent cognitive differences. The current results support this perspective, highlighting the importance of empirical verification over gender stereotypes in educational contexts. Teachers and career counselors should not assume that boys have natural advantages in fields requiring abstract reasoning, as such assumptions can become self-fulfilling prophecies that discourage girls from pursuing mathematics-intensive careers. The near-significant trend in visual-imagery thinking ($p = .055$) requires cautious interpretation. The p -value falls just above the conventional significance threshold, creating interpretive ambiguity. This could indicate a genuine but small effect that the current sample size lacks adequate statistical power to detect reliably. Alternatively, it may simply reflect random sampling variation in the absence of true population differences. Research with larger samples would be needed to resolve this ambiguity definitively.

Table 3. Ranking indicators of types of professional aptitude of teenagers

Thinking Styles	Gender	N	Mean Rank	Sum of Ranks
Propensity to work with people	Boys	47	46.84	2201.50
	Girls	52	52.86	2748.50
	Total	99		
Propensity for research (intellectual) activity	Boys	47	55.18	2593.50
	Girls	52	45.32	2356.50
	Total	99		
Propensity for experimental action	Boys	47	52.62	2473.00
	Girls	52	47.63	2477.00
	Total	99		
Propensity for aesthetic activity	Boys	47	46.28	2175.00
	Girls	52	53.37	2775.00
	Total	99		
Propensity for extreme activities	Boys	47	44.48	2090.50
	Girls	52	54.99	2859.50
	Total	99		
Propensity for planned economic activities	Boys	47	60.59	2847.50
	Girls	52	40.43	2102.50
	Total	99		

*Note: Compiled by the authors.

In the next stage of our research, the L. Yovaishi "Professional Propensity" questionnaire, modified by G. Rezapkina, was used to examine gender differences in adolescents' career orientations. The same statistical approach—Mann-Whitney U test for comparing independent groups—was applied to assess whether boys and girls differ in their vocational interests across six professional domains. Table 3 presents the ranking indicators of the types of professional aptitude of teenagers. Career orientation rankings revealed gender-specific patterns in vocational preferences, though these patterns proved less pronounced than the thinking style differences. Girls demonstrated higher mean ranks for three career domains: working with people (52.86 vs. 46.84, sum of ranks 2748.50 vs. 2201.50), aesthetic activities (53.37 vs. 46.28, sum of ranks 2775.00 vs. 2175.00), and extreme activities (54.99 vs. 44.48, sum of ranks 2859.50 vs. 2090.50). These rankings suggest that girls express greater interest in social, creative, and adventurous professional domains. The higher preference for working with people aligns with traditional expectations about female communal orientation, while the aesthetic activities preference corresponds with documented female interest in artistic and creative fields. The extreme activities pattern, however, contradicts conventional gender stereotypes that associate risk-taking and adventure-seeking with masculinity, suggesting that contemporary adolescent girls may be more open to physically demanding or dangerous careers than traditional gender roles would predict.

Boys showed higher mean ranks for three different career domains: research activities (55.18 vs. 45.32, sum of ranks 2593.50 vs. 2356.50), practical activities (52.62 vs. 47.63, sum of ranks 2473.00 vs. 2477.00), and planning-economic activities (60.59 vs. 40.43, sum of ranks 2847.50 vs. 2102.50). The research activities preference indicates male inclination toward scientific-analytical work and intellectual problem-solving. The practical activities advantage suggests interest in applied-technical fields involving hands-on work with tools, machinery, or physical systems. The most pronounced ranking difference appeared in planning-economic activities, where boys' mean rank substantially exceeded girls', reflecting much stronger orientation toward organizational-managerial careers, strategic planning, financial management, and business leadership. The magnitude of this difference (mean ranks 60.59 vs. 40.43) far exceeds any other career domain difference, suggesting that gender socialization may have particularly strong effects on business-oriented vocational interests.

Table 4. Statistical criteria for types of professional aptitudes of adolescents

	Propensity to work with people	Propensity for research (intellectual) activity	Propensity for experimental action	Propensity for aesthetic activity	Propensity for extreme activities	Propensity for planned economic activities
Mann-Whitney U	1073.500	978.500	1099.000	1047.000	962.500	724.500
Wilcoxon W	2201.500	2356.500	2477.000	2175.000	2090.500	2102.500
Z-value	-1.057	-1.761	-.883	-1.249	-1.846	-3.551
Asymptotic Significance (2-tailed)	.290	.078	.377	.212	.065	< .001
a. Grouping Variable: Gender						

*Note: Compiled by the authors.

However, as emphasized in the thinking styles analysis, ranking differences alone do not establish statistical significance. Table 4 presents the statistical criteria for types of professional aptitudes of adolescents, providing formal hypothesis tests to determine which observed differences represent reliable effects versus sampling variability. The results revealed a striking pattern: only one of the six career domains showed statistically significant gender differences, while the remaining five failed to reach conventional significance thresholds despite some showing substantial ranking differences. Planning-economic activities demonstrated highly significant gender differences ($U = 724.500$, Wilcoxon $W = 2102.500$, $Z = -3.551$, $p < .001$), with boys showing substantially stronger propensity for organizational, managerial, and financial careers. This robust finding, with p-value of $< .001$ ($p < .001$), indicates a meaningful and reliable gender gap in business-oriented vocational interests. The effect is among the strongest observed in the entire study, comparable to the object-action thinking difference. This pattern likely reflects gender role socialization that emphasizes male leadership, economic competence, and business acumen while channeling girls toward other professional domains. In Kazakhstani society, as in many cultures, business leadership and financial management remain male-dominated fields, and adolescents' career aspirations likely mirror these existing patterns.

Research activities approached but did not reach statistical significance ($U = 978.500$, Wilcoxon $W = 2356.500$, $Z = -1.761$, $p = .078$), suggesting a trend toward male preference for scientific-analytical work. The p-value of .078 falls between the .05 and .10 thresholds, creating interpretive complexity. By strict conventional standards ($\alpha = .05$), this result is non-significant, providing insufficient evidence to conclude that gender differences exist in research orientation. However, the relatively low p-value suggests this finding warrants attention and further investigation. With a larger sample size, this effect

might reach statistical significance, or conversely, the trend might disappear as sampling error is reduced. The most appropriate interpretation is that the current data provide suggestive but inconclusive evidence for male preference in research activities, and definitive conclusions require replication with larger samples.

All other career orientations showed non-significant differences, indicating no reliable evidence for gender gaps in these vocational domains. Working with people showed no significant difference ($U = 1073.500$, Wilcoxon $W = 2201.500$, $Z = -1.057$, $p = .290$), despite girls' higher mean rank. This finding contradicts stereotypes emphasizing female communal orientation and interpersonal interest, suggesting that both genders express comparable desire for socially-oriented careers. Practical activities similarly showed no significant difference ($U = 1099.000$, Wilcoxon $W = 2477.000$, $Z = -0.883$, $p = .377$), indicating comparable interest in hands-on technical work across genders. Aesthetic activities showed no significant difference ($U = 1047.000$, Wilcoxon $W = 2175.000$, $Z = -1.249$, $p = .212$), challenging assumptions about female artistic inclinations. Most surprisingly, extreme activities showed no significant difference ($U = 962.500$, Wilcoxon $W = 2090.500$, $Z = -1.846$, $p = .065$), despite girls' numerically higher mean rank. The p -value of .065 falls just above the .05 threshold, similar to the visual-imagery thinking pattern, creating similar interpretive ambiguity. The near-significant result could indicate a genuine small female advantage in risk-taking career interests that requires larger samples to detect reliably, or it might simply reflect sampling variability. The finding that girls showed numerically higher interest in extreme activities contradicts traditional masculine stereotypes and may reflect generational shifts in gender role attitudes among contemporary adolescents.

The non-significant results require careful interpretation to avoid both Type I errors (concluding differences exist when they do not) and Type II errors (failing to detect real differences due to insufficient statistical power). Statistical non-significance does not prove that gender differences are absent; it merely indicates insufficient evidence to conclude that differences exist. Several factors could explain non-significant results. First, true population differences may be absent or negligible in these domains, with career interests being genuinely gender-neutral. Second, small-to-moderate differences may exist but the current sample size ($n = 99$) lacks adequate statistical power to detect them reliably. Power analysis suggests that samples of 150-200 participants would be needed to reliably detect small effects with conventional power levels (.80). Third, measurement limitations may obscure true differences; if the career orientation questionnaire has limited reliability or validity, it may fail to capture genuine vocational interest patterns. Fourth, the specific sample characteristics—urban adolescents from a single school in Astana—may not be representative of broader populations where gender differences might be more pronounced.

The relationship between thinking styles and career orientations reveals theoretically meaningful patterns that support the study's conceptual framework linking cognitive styles to vocational preferences. Girls' advantages in verbal-logical thinking ($p = .047$) and creativity ($p = .040$) correspond logically with their numerical tendencies toward people-oriented and aesthetic careers, suggesting cognitive-vocational alignment. Verbal skills facilitate effective communication, persuasion, and relationship-building essential for social service professions, while creative thinking supports success in artistic and design fields. Boys' stronger planning-economic orientation ($p < .001$) aligns conceptually with their comparable abstract-symbolic thinking abilities ($p = .141$), as managerial-financial careers require strategic planning, logical analysis, and systematic decision-making. However, the study's correlational design prevents causal conclusions—it remains fundamentally unclear whether thinking styles shape career interests or whether career exploration and exposure develop corresponding cognitive patterns. Longitudinal research would be necessary to disentangle these directional relationships.

Several findings challenge traditional gender stereotypes and have important implications for career guidance practice. Most importantly, the absence of male superiority in abstract-symbolic thinking ($p = .141$) contradicts widespread assumptions about mathematical aptitude differences. This finding suggests that girls possess equal capacity for mathematical-logical reasoning and should be actively

encouraged to pursue STEM careers requiring these skills. Career counselors and educators should avoid gender-based assumptions about mathematical ability and instead focus on individual assessment and interest development. Similarly, comparable interest levels in working with people ($p = .290$), aesthetic activities ($p = .212$), and practical activities ($p = .377$) suggest that vocational preferences are more gender-neutral than cultural stereotypes indicate. Career guidance programs should present all professional options as viable for both genders, challenging restrictive gender role expectations that may limit adolescents' exploration of their full potential.

The only robust and reliable gender difference—boys' substantially higher planning-economic orientation ($p < .001$)—may reflect socialization factors and structural inequalities rather than inherent cognitive or motivational differences. Leadership roles, business careers, and financial management positions remain male-dominated in Kazakhstan and globally, and adolescents' career aspirations likely mirror these existing patterns. Boys may receive more encouragement, role modeling, and concrete exposure to business and management careers through family connections, media representation, and educational tracking. Girls, conversely, may face subtle or explicit discouragement from business-oriented careers through stereotypes questioning female leadership capability or concerns about work-family balance. These results underscore that observed gender differences in vocational interests cannot be interpreted as reflecting natural or inevitable patterns but must be understood as products of complex socialization processes that can and should be challenged through intentional educational interventions.

Conclusion. Several methodological limitations warrant consideration when interpreting these findings. First, the sample was drawn from a single urban school in Astana, limiting generalizability to rural populations or other regions of Kazakhstan where educational opportunities and gender socialization patterns may differ. Second, the cross-sectional design precludes causal inferences about the directionality of thinking style-career orientation relationships. Longitudinal research is needed to establish whether thinking styles precede and shape career interests or whether exposure to certain activities develops corresponding cognitive patterns. Third, the reliance on self-report instruments introduces potential bias from social desirability and limited self-awareness among adolescent participants. Future studies should incorporate performance-based cognitive assessments and behavioral observations to triangulate findings. Fourth, the study did not control for potentially confounding variables such as academic achievement, parental occupation, socioeconomic status, and prior career exploration experiences, all of which may influence both thinking styles and career orientations. Fifth, the binary gender classification does not account for non-binary identities or the distinction between biological sex and gender identity, limiting the theoretical precision of gender-related interpretations. Finally, the statistical approach focused on univariate comparisons without examining multivariate relationships or interaction effects, preventing analysis of how thinking styles and career orientations jointly relate to gender or how multiple thinking styles combine to predict specific career propensities.

The evidence from the study indicates that there are notable gender differences in adolescents' thinking styles and professional inclinations. Girls demonstrated higher results in object-activity thinking, verbal-logical thinking, visual-figurative thinking, and creativity. In contrast, boys showed a stronger tendency toward abstract-symbolic thinking and a greater propensity for research activities.

Moreover, statistical analysis confirmed the significance of gender differences in object-activity thinking, verbal-logical thinking, and creativity. Although differences were observed in visual-figurative and abstract-symbolic thinking, their statistical significance was not fully established.

In terms of professional inclinations, girls achieved higher scores in domains related to working with people, aesthetic activities, and extreme activities. Conversely, boys displayed stronger results in planning-economic and research (intellectual) activities. Overall, the findings demonstrate that gender differences exert an influence on cognitive styles and professional orientation patterns.

These distinctions should be carefully considered in the fields of career guidance, education, and professional development. Furthermore, future research should aim to investigate the underlying causes of gender differences more deeply, as well as to examine the influence of cultural and social factors on the formation of these tendencies.

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