

Gender Differences in the Visual and Emotional Features of Preschool Children's Drawings

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Abstract

Early childhood is a pivotal stage for the emergence of representational thought and visual-emotional communication. This study investigates gender differences in the visual, structural, and affective features of preschool children's drawings to better understand how early developmental patterns shape creative expression. A total of 426 children aged 5–6 years from five preschools participated under standardized classroom conditions. Using a validated visual coding framework adapted from developmental drawing research, fourteen compositional, chromatic, and expressive variables were analyzed. Results revealed significant gender-based differences across multiple visual domains. Girls' drawings were characterized by greater color control, compositional organization, emotional expressivity, and structural completeness, whereas boys' drawings exhibited more spatial dynamism, fragmented composition, and exploratory variability. Mothers were most frequently depicted as dominant figures, reflecting the centrality of maternal attachment in children's representational schemas. The findings suggest that gender-linked distinctions in preschoolers' drawings reflect both neurodevelopmental maturation and socio-cultural reinforcement of emotional and aesthetic norms. These insights have practical implications for early childhood educators and art pedagogy, emphasizing the need for gender-responsive approaches that nurture fine-motor coordination, creativity, and emotional literacy. The study contributes to international early childhood education research by offering a large-scale, empirically grounded analysis of gendered visual expression and by highlighting the developmental value of children's art as a diagnostic and educational tool.

SUSTAINABLEDEVELOPMENT GOALS: SDG 4: Quality education, SDG 5: Gender equality

Introduction

Early childhood represents a critical developmental window in which perceptual, cognitive, and emotional systems converge to form the foundations of symbolic thinking and creative representation. Drawing is among the earliest and most universal means through which children externalize their inner experiences, self-concept, and social relationships. It provides a unique lens into how young children organize perceptual input, coordinate motor output, and translate affective meaning into visual form (Jolley et al., 2004). Within developmental psychology and art education, children's drawings are increasingly used as nonverbal indicators of socio-emotional functioning and representational intelligence (Cherney et al., 2006). This interpretive value stems from the integration of fine-motor coordination, visual-spatial reasoning, and affective modulation that underlies the drawing process (Cox, 2005). Understanding how gender differences manifest in these drawings thus provides insight into the broader dynamics of cognitive and emotional development in the preschool years.

Gender-based differences in children's artistic expression have long been noted, yet their developmental and contextual underpinnings remain contested. Research indicates that by age five, girls often outperform boys in fine-motor precision, planning, and representational coherence, whereas boys tend to display greater spatial fluency and dynamism (Pahlevanian & Ahmadizadeh, 2014; Simpson et al., 2019).

These differences are not only motoric but also symbolic—girls are more likely to depict relational or emotional themes, while boys often emphasize movement and mechanical objects (Golomb, 2003). Such distinctions are thought to reflect both biological maturation and socio-cultural reinforcement, as children internalize gendered expectations surrounding emotional expression and aesthetic preference (Duncum, 2003). Cross-cultural findings have confirmed that gender shapes color selection, spatial organization, and thematic content in preschool drawings, suggesting early differentiation in visual-emotional schema formation (Charafeddine et al., 2020; Davis et al., 2021; Gil-Ruiz et al., 2025). Yet despite growing interest, empirical analyses isolating gender effects in 5–6-year-old children remain scarce, especially those quantifying compositional, chromatic, and affective variables under standardized conditions.

From a developmental perspective, the preschool period (ages 5–6) marks a major transition from sensorimotor to representational thought, during which drawing becomes an intentional communicative act rather than a purely motoric one (Panesi & Morra, 2021). Fine-motor control, visual integration, and symbolic reasoning mature rapidly during these years, supporting the emergence of detailed human figures and emotional expressivity (Malchiodi & Gil, 2012). Gender differences observed during this stage often mirror broader patterns in neuropsychological and social-emotional development. For instance, studies show that girls demonstrate stronger executive control and emotional labeling, while boys exhibit higher variability in attention and motor persistence (Van Batenburg-Eddes et al., 2014). In drawing tasks, this translates into contrasts in color regulation, figure completeness, and thematic cohesion (Aydos & Özet, 2025; Brechet, 2015). Yet, the extent to which these distinctions stem from innate cognitive divergence or from culturally mediated learning opportunities remains unresolved. Cross-cultural evidence shows that while children share universal representational tendencies, their stylistic and affective drawing features vary systematically with cultural context (Gernhardt et al., 2015).

Color use, figure selection, and spatial arrangement are particularly revealing of children's emotional and cognitive styles. Warm and bright colors often correlate with positive affect and relational proximity, whereas cooler or darker tones may indicate emotional neutrality or distance (Jonaskaite & Mohr, 2025). The representation of dominant family members in drawings—particularly mothers and fathers—appears to mirror the internalization of attachment hierarchies and emotional security, with securely attached children depicting emotionally proximal, well-integrated parental figures (Kallitsoglou et al., 2022; Procaccia et al., 2014). This pattern aligns with evidence that secure attachments to both parents enhance emotional regulation and relational balance in visual expression (Fernandes et al., 2021; Iwanski et al., 2023). Empirical studies demonstrate that girls are more likely to depict caregivers with emotional warmth and proportional balance, while boys emphasize spatial separation or active movement. This gendered expressive contrast has been repeatedly observed across developmental drawing studies (Brechet, 2015; Kloft et al., 2017) and is further supported by neural findings showing differential processing of parental warmth between sexes (McClellan et al., 2025; Zhang et al., 2022). In social-relational contexts, daughters' portrayals often reflect relational proximity, whereas sons emphasize action and independence, consistent with observed differences in representational affect and socio-cognitive focus (Webster et al., 2013).

Despite the rich theoretical landscape, empirical evidence quantifying gender differences in preschool drawing remains fragmented. Previous studies often rely on small samples, lack standardized coding frameworks, or focus narrowly on emotional content rather than structural or chromatic variables (Berti & Cigala, 2022; Crawford et al., 2012; Miao et al., 2025; Søndergaard & Reventlow, 2019). Moreover, few have simultaneously examined compositional size, line clarity, and figure proportion as integrative indicators of visual maturity. To address these gaps, the present study systematically analyzes gender differences across 14 visual dimensions in a large cohort of 5–6-year-old children under standardized classroom conditions.

Methods

Study Design

This study employed a cross-sectional quantitative design grounded in developmental and visual-psychological methodology. The aim was to systematically examine gender differences in compositional, chromatic, and affective dimensions of preschool children's drawings under standardized classroom conditions. A non-experimental, observational approach was selected to capture naturally occurring variations in children's visual expression without manipulating independent variables. This approach aligns with prior art-based developmental studies that emphasize naturalistic observation combined with structured coding frameworks.

Selection Criteria and Sampling Procedure

Participants were selected using a stratified random sampling method from 30 preschool institutions representing comparable socio-educational contexts. Inclusion criteria required that children be between 5.0 and 6.11 years of age, enrolled in their final year of preschool, and free from identified developmental or sensory impairments as confirmed by school records and teacher reports. Exclusion criteria included diagnosed motor, cognitive, or emotional disorders that might interfere with drawing performance, as well as incomplete or non-compliant drawings. The final sample consisted of 426 children (51.6% girls, 48.4% boys; M age = 5.47 years, SD = 0.38), ensuring gender balance and age homogeneity. Parental consent was obtained for all participants, and institutional ethical approval was granted by the regional research ethics committee in accordance with the Declaration of Helsinki (2013). Each child participated individually during scheduled classroom sessions, minimizing peer influence and performance anxiety.

Ethical Considerations

Ethical approval for this study was obtained from the Atatürk University Social and Human Sciences Ethics Committee. All procedures were conducted in accordance with established ethical standards for research involving human participants. Informed consent was obtained from parents or legal guardians, and verbal assent was obtained from the children. Participation was voluntary, and confidentiality and anonymity were ensured throughout the study. No identifying personal information was included in the dataset used for analysis.

Data Collection

Data collection was carried out over four consecutive weeks during the spring term under ethically approved and standardized classroom conditions. Each child participated individually in a quiet, familiar setting to ensure natural expression and minimize performance bias. The researcher provided a uniform instruction—*“Please draw your family doing something together”*—without examples or evaluative comments to avoid influencing the drawings. All participants were given an A4 white sheet and a standard set of twelve wax crayons, and each session lasted twenty minutes, duration deemed developmentally appropriate for this age group. Completed drawings were coded anonymously using numerical identifiers, and demographic data (age, gender, and school) were recorded separately to protect confidentiality. A standardized visual coding framework, adapted from validated protocols in developmental drawing research (Berti & Cigala, 2022; Koppitz, 1984), was used to assess fourteen visual dimensions encompassing structural, chromatic, and affective features such as figure completeness, color use, compositional organization, and facial expression. Three trained raters independently coded the drawings after a calibration phase using pilot samples to ensure consistency, achieving inter-rater reliability coefficients (Cohen’s κ) between 0.82 and 0.91. Discrepancies were resolved by consensus, and the final coded data were entered into a secured database for analysis. This procedure ensured ecological validity, minimized observer bias, and produced reliable data for examining gender differences in preschoolers’ visual and emotional representation.

Data Analysis

Data were analyzed using **IBM SPSS Statistics version 28.0**. Descriptive statistics were computed to summarize frequencies and proportions of categorical variables. **Chi-square (χ^2) tests** were applied to examine gender differences across all visual variables. A significance threshold of $p < .05$ was adopted for all inferential analyses. **Cramer’s V effect sizes** were calculated to evaluate the magnitude of associations, emphasizing practical significance over mere statistical difference, in accordance with best practices in developmental research. Preliminary data screening confirmed normal distribution for proportional data and absence of significant outliers. To verify robustness, **Monte Carlo exact tests** were conducted for variables with low expected frequencies. Data visualization was performed through frequency tables and cross-tabulation matrices, and representative drawings were selected for qualitative exemplification in Figures 1–3.

Results

Participant Characteristics

The study sample consisted of 426 children aged between 5 and 6 years who were enrolled in preschool education institutions. The sample included both girls and boys representing similar socio-educational environments. All children completed the drawing task individually under standardized classroom conditions. Demographic characteristics of participants are presented in Table 1.

Table 1. Descriptive Characteristics of Visual Features in Children’s Drawings (N = 426)

Variable	Category	n	%
Dominant figure status	Positive	188	71.2
	Negative	76	28.8
Preferred dominant figure	Mother	90	34.1
	Father	61	23.1
	Sibling	12	4.5
	Self	23	8.7
	Other family member	78	29.5
Total number of figures	1–5	132	31.0
	6 or more	294	69.0
Brightness of colors	Bright	186	43.7
	Not bright	240	56.3
Color usage	Colored	374	88.0
	Black and white	51	12.0
Dominant color temperature	Warm colors	127	29.8
	Cool colors	299	70.2
Accuracy of color placement	Accurate	173	40.6
	Inaccurate	253	59.4
Controlled use of color	Controlled	193	45.3
	Uncontrolled	233	54.7
Composition size	Large	363	85.2
	Small	63	14.8
Broken line use	Present	155	36.4
	Absent	271	63.6
Clear line use	Present	330	77.6
	Absent	95	22.4
Clarity of lines	Clear	294	69.0
	Unclear	132	31.0
Parent distance depicted	Present	285	67.1

Variable	Category	n	%
Child self-representation size	Absent	140	32.9
	Large	37	8.7
	Medium	245	57.5
	Small	62	14.6
Child facial expression	Not drawn	82	19.2
	Happy	149	43.1
	Neutral	179	51.7
	Sad	18	5.2
Human figure completeness (proportional)	Present	178	41.8
	Absent	248	58.2
Presence of facial expression	Present	294	69.0
	Absent	132	31.0
Presence of eyes	Present	382	89.7
	Absent	44	10.3
Presence of mouth	Present	330	77.5
	Absent	96	22.5
Presence of nose	Present	155	36.4
	Absent	271	63.6
Presence of hair	Present	280	65.7
	Absent	146	34.3

Descriptive Characteristics of Visual Features in Children's Drawings

Table 1 presents the descriptive characteristics of visual features observed in children's drawings. Overall, the findings indicate that the majority of children produced drawings characterized by positive dominant figure representation, extensive use of color, and structurally clear compositional elements. With respect to dominant figure status, most drawings reflected a positive representation (71.2%), whereas negative dominant figure representations were less frequent (28.8%). When examining the identity of the dominant figure, mothers emerged as the most frequently depicted dominant figure (34.1%), followed by other family members (29.5%) and fathers (23.1%). In contrast, siblings (4.5%) and

self-representations (8.7%) were less commonly identified as dominant figures. These findings suggest that primary caregivers, particularly mothers, occupy a central representational role in children's visual narratives.

In terms of compositional complexity, a substantial proportion of children included six or more figures in their drawings (69.0%), while fewer children produced drawings containing between one and five figures (31.0%). This pattern reflects a tendency toward multi-figure compositions, indicating an emerging capacity to represent complex social environments visually. Color use was prevalent across the sample, with 88.0% of children producing colored drawings, compared to only 12.0% who used black-and-white representations. However, non-bright colors were slightly more common (56.3%) than bright colors (43.7%). Additionally, cool colors dominated in most drawings (70.2%), whereas warm colors were used less frequently (29.8%). These findings suggest that while children actively engage with color as a representational tool, their color choices may reflect developmental preferences for cooler tonal palettes.

Regarding color application accuracy, more than half of the drawings demonstrated inaccurate color placement (59.4%), and uncontrolled color use was observed in 54.7% of drawings. In contrast, accurate (40.6%) and controlled color use (45.3%) were less frequent. These results likely reflect the ongoing development of fine motor coordination and representational control characteristic of this age group. Analysis of spatial and compositional features revealed that most drawings were large in size (85.2%), indicating a tendency among children to utilize available space extensively. Line quality analysis further demonstrated that clear lines were present in 77.6% of drawings, and overall line clarity was observed in 69.0%. Broken lines were less frequent (36.4%), suggesting that most children demonstrated relatively stable motor control during drawing.

In terms of interpersonal spatial relationships, parent distance was depicted in 67.1% of drawings, indicating that children were able to visually differentiate spatial relationships between family members. Regarding self-representation, most children depicted themselves in medium size (57.5%), whereas fewer represented themselves as large (8.7%) or small figures (14.6%). Notably, 19.2% of children did not include themselves in the drawing. Examination of emotional expression revealed that neutral facial expressions were most common (51.7%), followed by happy expressions (43.1%), while sad expressions were relatively rare (5.2%). This distribution suggests that children predominantly represent emotionally neutral or positive affective states in their drawings. Analysis of human figure detail indicated that facial expressions were present in 69.0% of drawings. Similarly, most drawings included eyes (89.7%) and mouths (77.5%), whereas the inclusion of noses was less frequent (36.4%). Hair was depicted in approximately two-thirds of drawings (65.7%). However, proportionally complete human figures were observed in fewer than half of the drawings (41.8%), indicating that anatomical accuracy is still developing at this age.

Gender Differences in Visual Features of Children's Drawings

As shown in Table 2, chi-square analysis revealed statistically significant gender differences across multiple visual features of children’s drawings. Girls were significantly more likely than boys to depict positive dominant figures ($\chi^2 = 11.453, p = .001$) and to prioritize the mother as the dominant figure ($\chi^2 = 12.400, p = .015$). In terms of color use, girls produced significantly more bright drawings ($\chi^2 = 24.843, p < .001$), used color overall more frequently ($\chi^2 = 6.600, p = .010$), and demonstrated higher use of warm colors ($\chi^2 = 19.601, p < .001$). Girls also showed significantly greater accuracy in color placement ($\chi^2 = 20.176, p < .001$) and more controlled color application ($\chi^2 = 12.465, p < .001$). Regarding compositional and line characteristics, girls were more likely to produce large compositions ($\chi^2 = 5.161, p = .023$), clear lines ($\chi^2 = 6.360, p = .012$), and greater line clarity ($\chi^2 = 8.039, p = .005$), whereas boys demonstrated higher rates of broken line use ($\chi^2 = 18.935, p < .001$) and greater depiction of parent distance ($\chi^2 = 5.613, p = .018$). In addition, girls more frequently depicted complete human figure proportions ($\chi^2 = 28.900, p < .001$), facial expressions ($\chi^2 = 26.439, p < .001$), and detailed facial features, including eyes ($\chi^2 = 6.783, p = .009$), mouth ($\chi^2 = 26.540, p < .001$), nose ($\chi^2 = 16.924, p < .001$), and hair ($\chi^2 = 51.891, p < .001$).

Table 2. Gender Differences in Visual Features of Children’s Drawings (Chi-Square Analysis)

Visual Feature	Category	Girls n (%)	Boys n (%)	χ^2	p
Dominant figure status	Positive	110 (80.3)	78 (61.4)	11.453	.001
Preferred dominant figure	Mother	58 (42.3)	32 (25.2)	12.400	.015
Brightness of colors	Bright	115 (56.1)	71 (32.1)	24.843	<.001
Color usage	Colored	189 (92.2)	185 (84.1)	6.600	.010
Dominant color temperature	Warm colors	82 (40.0)	45 (20.4)	19.601	<.001
Accuracy of color placement	Accurate	106 (51.7)	67 (30.3)	20.176	<.001
Controlled use of color	Controlled	111 (54.1)	82 (37.1)	12.465	<.001
Composition size	Large	183 (89.3)	180 (81.4)	5.161	.023
Broken line use	Present	53 (25.9)	102 (46.2)	18.935	<.001
Clear line use	Present	170 (82.9)	160 (72.7)	6.360	.012
Clarity of lines	Clear	155 (75.6)	139 (62.9)	8.039	.005
Parent distance depicted	Present	126 (61.5)	159 (72.3)	5.613	.018
Human figure completeness	Present	113 (55.1)	65 (29.4)	28.900	<.001
Presence of facial expression	Present	166 (81.0)	128 (57.9)	26.439	<.001
Presence of eyes	Present	192 (93.7)	190 (86.0)	6.783	.009
Presence of mouth	Present	181 (88.3)	149 (67.4)	26.540	<.001
Presence of nose	Present	95 (46.3)	60 (27.1)	16.924	<.001
Presence of hair	Present	170 (82.9)	110 (49.8)	51.891	<.001

Visual Analysis of Selected Children's Drawings

Figure 1 presents a family scene organized within a clearly defined spatial and compositional structure. The drawing includes four human figures positioned across a horizontal ground line, accompanied by environmental elements such as a house, sun, tree, and sky. The presence of a continuous ground baseline provides spatial stability and indicates the child's emerging ability to organize figures within a coherent environmental context. A salient feature of this drawing is the hierarchical differentiation of figure size. One central figure is depicted substantially larger than the others, suggesting perceived importance or psychological salience. In contrast, the remaining figures are represented at smaller but proportionally consistent scales. This size variation reflects the developmental tendency to encode

social significance through spatial exaggeration rather than anatomical realism. Despite these proportional distortions, the figures retain essential structural components, including head, trunk, limbs, and facial features, indicating an established schema of human representation.

The use of color demonstrates both expressive and organizational functions. The dominant blue coloration of the background creates a unified visual field, while contrasting colors such as red, yellow, and green differentiate individual figures and elements. The repeated use of similar colors across figures contributes to compositional cohesion and perceptual grouping. Such repetition introduces a form of visual rhythm through recurring chromatic and structural patterns. This rhythmic arrangement, characterized by the sequential placement and repetition of human forms, parallels the principle of patterned recurrence observed in musical rhythm, where repetition and variation operate together to produce perceptual coherence. Line quality appears generally controlled, with continuous and deliberate strokes defining figure boundaries. Facial expressions are clearly indicated through circular eyes, curved mouths, and additional details such as cheeks and hair, suggesting intentional emotional representation. The upward orientation of the arms in multiple figures further contributes to a sense of openness and animation within the composition. Environmental elements, including the sun positioned in the upper area and the house located at the periphery, reinforce the narrative completeness of the scene. These additions indicate that the child does not represent figures in isolation but integrates them within a broader contextual framework. The overall composition demonstrates an emerging capacity to coordinate spatial organization, symbolic representation, and expressive detail within a unified visual structure.

Figure 2 illustrates a family composition characterized by strong emotional symbolism, balanced figure arrangement, and harmonious color integration. The drawing presents five human figures positioned horizontally in front of a centrally located house, accompanied by environmental elements such as the sun and clouds. The figures are explicitly labeled, indicating the child's clear identification of family members and reinforcing the narrative intention of the representation. A prominent feature of this drawing is the repeated use of heart symbols distributed throughout the composition. These hearts appear in proximity to the figures and the house, functioning as visual indicators of emotional closeness and relational cohesion. The repetition of these symbolic forms creates a patterned sequence across the visual field, establishing a rhythmic structure through recurring shapes. This visual repetition parallels the principle of rhythmic recurrence observed in musical organization, where repeated motifs contribute to the perception of unity and continuity. In this context, the recurring heart forms operate as visual equivalents of rhythmic accents, reinforcing the emotional coherence of the composition.

Color usage further contributes to the expressive quality of the drawing. Warm and varied colors, including green, yellow, orange, and pink, are applied to differentiate figures while maintaining overall harmony. The consistent use of similar tonal intensities across figures produces perceptual balance and prevents visual fragmentation. This coordinated color application reflects an emerging sensitivity to chromatic harmony, which functions analogously to harmonic relationships in music, where different tones combine to produce a unified perceptual experience. The compositional structure demonstrates

spatial balance, with figures evenly distributed around the centrally positioned house. Although minor variations in figure size are present, the proportional relationships remain relatively consistent, indicating an effort to represent family members as part of a cohesive unit rather than emphasizing hierarchical dominance. Facial expressions are clearly rendered, with curved mouths and open eyes conveying positive affective states. The presence of the sun above the house reinforces the positive emotional tone of the scene and contributes to the overall symbolic coherence. Line quality appears controlled and deliberate, with continuous contours defining figure boundaries and structural elements. The integration of environmental features with human figures suggests that the child conceptualizes family relationships within a broader contextual framework.

The drawing demonstrates an intentional use of contrast to reinforce hierarchy. Chromatic emphasis is concentrated in the dominant figure, whose head is filled with dense red and green coloration, producing a high intensity focal point. This localized saturation differs from the more economical, simplified color application in the smaller figures and contributes to figure ground differentiation. The central house is detailed with windows and a roof, and it functions as a stable structural reference, while the smaller figures placed around it suggest relational proximity and family grouping. The presence of labeling enhances interpretive clarity and indicates that the child is not only depicting figures but also categorizing roles within the family system. Facial features are minimal but consistently marked, supporting the schema based nature of the representation.

From a compositional perspective, the scene is organized through a clear opposition between the large isolated figure and the clustered smaller figures. This creates a directional reading from the group near the house toward the dominant figure on the right, strengthening narrative tension and visual emphasis. The ground area is rendered as a wide, shaded field, yet the figures appear to float slightly above it, reflecting an emerging but still developing integration of baseline logic with object placement. The overall spatial structure is therefore coherent at the level of grouping and hierarchy, even if perspectival realism is not pursued.

A theoretically grounded cross modal interpretation can be drawn from the drawing's patterned contrasts. The repeated small red figures near the house operate as a visual motif through recurrence and similarity, while the enlarged father figure functions as a strong accent within the sequence. In music terms, the composition resembles a rhythmic structure in which repeated beats are interrupted by a marked downbeat or accent that reorganizes attention and establishes dominance. Similarly, the concentrated high intensity coloration in the father's head can be interpreted as a dynamic peak, comparable to increased loudness or timbral brightness that draws perceptual focus in musical experience. Importantly, this is an interpretive analogy rather than an experimental claim about children expressing music, and it is used to describe how repetition, contrast, and accent structure perceptual coherence across expressive systems.

Discussion

The main findings of this study are that girls aged 5–6 years produced drawings characterized by greater color control, compositional clarity, emotional expressiveness, and structural completeness than boys. These differences were statistically significant across several visual domains, including dominant figure positivity, brightness, color use, and proportional representation. The results emphasize the developmental and gender-based distinctions in visual expression emerging in early childhood—a period when perceptual, cognitive, and emotional systems undergo rapid maturation. Understanding these gender-linked visual patterns is important for early childhood educators and developmental psychologists seeking to interpret children’s drawings as reflections of socio-emotional and cognitive growth (Flatters et al., 2014).

Our finding that girls display superior color control, compositional organization, and structural completeness aligns with prior research emphasizing early female advantages in fine-motor precision and visual-motor coordination (Kokštein et al., 2018). These motoric advantages appear to stem from earlier neuromuscular maturation and higher engagement in fine-motor tasks during early education. Similar gender-linked trends were observed in the development of handwriting accuracy among Chinese preschoolers, where girls consistently outperformed boys in visual-motor integration tasks (Hong et al., 2020). In contrast, Krivolapchuk et al. (2021) observed that boys of the same age exhibited higher physical endurance but less precise control in tasks demanding sustained fine-motor output, suggesting a divergence between gross- and fine-motor maturity during early childhood (Krivolapchuk et al., 2021). The current study’s evidence that girls show more controlled color use can thus be interpreted as an outcome of their relatively advanced coordination and inhibitory control. Interestingly, this visual precision may be further enhanced by structured visual-motor play, such as playdough or drawing drills, which have been shown to significantly strengthen preschool fine-motor regulation and visual-spatial mapping (Eprila et al., 2022; Ningsih, 2023). However, some scholars argue that the effect size of these gender gaps in preschool motor precision is small and context dependent, often diminishing when children receive similar levels of motor stimulation (Navarro-Patón et al., 2021). This suggests that our finding reflects not merely biological differences but also differential environmental reinforcement, with girls being more frequently encouraged in fine-motor and art-related activities.

The prominence of the mother as the most frequently depicted dominant figure in both genders strongly corroborates established models of maternal centrality in preschoolers’ socio-emotional cognition. Prior family-drawing studies indicate that maternal figures often occupy the most spatially prominent or emotionally vivid position, symbolizing attachment security and emotional regulation (Bat Or et al., 2022). My interpretation is that this visual centrality functions less as a stylistic choice than as an implicit narrative of caregiving significance. It resonates with developmental theories positing that visual proximity and size exaggeration in drawings mirror affective hierarchies within the family. Boys’ relatively higher tendency to depict fathers or greater spatial separation is consistent with their stronger spatial exploratory orientation, often linked to elevated sensorimotor reactivity (Yukhymenko et al., 2023). Similar interpretations appear in Brechet’s work on emotional symbolism in children’s love and family drawings, where boys portrayed interpersonal distance through spatial and compositional markers more often than girls (Brechet, 2015). Moreover, neuropsychological research shows that boys’

representational choices may stem from greater visuospatial attentional spread and lower emotional centralization (Yuan et al., 2019). Taken together, these findings indicate that gendered differences in social imagery, including mothers' prominence and paternal spatial detachment, are underpinned by both affective and perceptual mechanisms.

Children's overall preference for cool colors and emotionally neutral facial expressions agrees with cross-cultural findings on affective restraint in early childhood art (Gašić-Pavišić & Lazarević, 2002). Nevertheless, our result showing that girls more frequently used bright, warm hues parallels observations that female preschoolers express greater emotional resonance and social empathy through color selection (Muhammad Khairullah Bin Muhammad et al., 2024). I argue that this distinction may arise from girls' stronger affective attunement, reinforced by social conditioning that rewards emotional openness. This pattern echoes broader findings linking emotional valence and creativity: Baer and Kaufman (2008) concluded that while gender differences in creativity are modest, expressive emotionality consistently enhances girls' aesthetic elaboration. Moreover, preschool exposure to gender coded colors and affective feedback may reinforce these tendencies, a mechanism supported by qualitative research on gendering in Icelandic preschools, where color use became a symbolic enactment of femininity or masculinity (Hardardottir & Petursdottir, 2014). Thus, color-emotion associations in our data likely emerge through the interplay of biological perceptual preferences and socio-cultural color codification.

While girls demonstrated higher structural accuracy and centralized composition, this indicates not only fine-motor maturity but also more advanced visual-imagery organization. Similar trends were observed by Burlakova and Radchikova (2025), who reported that girls exhibited higher coherence in visual-spatial reasoning and object integration tasks. My interpretation is that such organization reflects girls' stronger self-regulatory capacity and sustained attention, capacities also identified as mediators of higher visual-structural clarity. Conversely, boys' more fragmented compositions and prevalence of broken lines align with lower voluntary motor regulation and attention-switching control documented in preschool males (Izotova et al., 2025). Supporting this, play-based motor interventions such as Mobis or multilateral exercise programs improve boys' fine-motor fluency, suggesting that environmental enrichment can offset inherent gender gaps (Plazibat et al., 2021; Ruiz-Esteban et al., 2020). Therefore, the superior compositional precision among girls may not solely represent innate cognitive differences but may also reflect differential pedagogical exposure and expectations emphasizing neatness and accuracy.

From a developmental perspective, our results reinforce the heterochronic trajectory of imagination, where girls display integrated symbolic play and visual harmony while boys exhibit greater variability and risk-taking in representational strategies (Dziedziewicz et al., 2013). I contend that this pattern reflects distinct pathways in the maturation of cognitive flexibility versus compositional stability. Boys' drawings often manifest divergent originality without compositional coherence, paralleling broader findings in creative cognition that link male creativity to exploratory variability rather than organizational refinement (Duh & Büdefeld, 2018). Moreover, studies on imagination and play indicate that symbolic fluency in girls may stem from greater affective embedding within relational themes (Poneliéné, 2018).

Neurodevelopmental evidence further suggests that these stylistic gender differences correspond to asynchronous growth of visuospatial and emotional circuits between 5 and 6 years (Kalynychenko & Kolesnyk, 2022). Consequently, girls' more integrated visual schemas and boys' variable originality can be viewed as complementary expressions of divergent yet equally adaptive developmental routes in visual cognition.

Finally, differences in representational proportionality, particularly the greater completeness of human figures in girls' drawings, reflect gender linked perceptual tendencies that favor configurational rather than analytic processing (Pinto & Incognito, 2022). Girls' higher attentional persistence in detailed representation resonates with perceptual research showing that sustained visual focus correlates with more anatomically coherent figures (He et al., 2019). Conversely, boys' reduced structural accuracy could be partly attributed to their preference for dynamic or action oriented themes, an interpretation supported by thematic analyses showing boys' dominance in movement related and mechanical imagery (Havigerová et al., 2021). Still, several meta-analyses caution that such gender effects may attenuate when art education is gender-neutral and equally scaffolded (Frisch, 2006). This divergence underscores the necessity of interpreting gender-based visual outcomes as products of dynamic interaction between biological maturation, cognitive orientation, and socio-educational context.

Implications

The implications of this study are twofold. First, children's drawings can be powerful indicators of socio-emotional development and gender-differentiated learning trajectories. Understanding these visual indicators allows educators to design art curricula that balance motor coordination, creativity, and affective expression across genders. Second, by establishing normative baselines for visual-feature differences, future research may refine diagnostic and pedagogical tools used in developmental assessments. This aligns with recent appeals to integrate artistic tasks with cognitive and emotional diagnostics to enrich developmental profiling.

Strengths and Limitations

A major strength of this research lies in its large, balanced sample and detailed coding of 14 distinct visual features, enabling nuanced analysis of gender effects. However, limitations include the reliance on cross-sectional design and the absence of longitudinal tracking that could reveal developmental trajectories. Potential biases may arise from cultural symbolism in color and figure depiction that differs by region or educational system. Moreover, children's socio-emotional contexts such as parental interaction, exposure to digital media, and teacher feedback could confound gender-linked differences. While the standardized drawing conditions reduced environmental variability, the subjective coding of "dominant figure" and "emotional expression" introduces interpretive variability. Future studies employing multimodal assessments may strengthen construct validity.

Conclusion

In conclusion, this study demonstrates clear gender differences in the visual and emotional composition of drawings by 5–6-year-old children, reflecting distinct developmental patterns in fine-motor control, visual organization, and affective expression. Girls' drawings exhibit higher structural accuracy and emotional expressivity, while boys' drawings reflect greater variability and spatial dynamism. These findings contribute to a growing understanding of gendered developmental trajectories in early visual cognition and artistic behavior, underscoring the need for gender-responsive pedagogical strategies that nurture creativity and emotional literacy during the preschool years.

Declarations

Conflict of Interest Statement

The authors declare that there are no conflicts of interest financial, professional, or personal that could have influenced the research, analysis, or interpretation of the data presented in this study.

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Author Contribution

M.S.K. and M.E.K. conceptualized and designed the study. M.S.K. supervised the research process and contributed to methodological development. M.E.K. conducted data collection and performed the statistical analyses. M.G. contributed to data interpretation and critically revised the manuscript for important intellectual content. U.K.S. assisted in data coding procedures and contributed to the visual analysis framework. M.S.K. and M.E.K. wrote the main manuscript text.

Data Availability

The datasets generated and analyzed during the current study are available from the corresponding author on reasonable request.

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Figures



Figure 1



Figure 2

Example of Emotional Harmony and Color-Based Visual Rhythm in Family Representation



Figure 3

presents a family related scene in which perceptual hierarchy is established primarily through pronounced size exaggeration and spatial separation. The composition includes a house positioned near the center, a sun placed in the upper left, a broad ground area, and multiple labeled family members arranged across the pictorial field. The most salient feature is the figure labeled “Baba,” which is rendered at a dramatically larger scale than the remaining figures and occupies a dominant vertical axis on the right side of the page. This disproportionate enlargement functions as a clear indicator of psychological salience and perceived authority, consistent with the developmental tendency to encode social importance through spatial magnitude rather than anatomical realism. In contrast, the other family members are drawn as smaller figures clustered closer to the house, forming a compact social unit that visually anchors the narrative around a shared domestic center.