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PSYCHOLOGICAL BOUNDARIES AND SPACE SOVEREIGNTY IN THE DIGITAL AGE: INTERGENERATIONAL DIFFERENCES AMONG GENERATIONS X, Y, AND Z

ПСИХОЛОГІЧНІ МЕЖІ ТА ПРОСТОРОВИЙ СУВЕРЕНІТЕТ У ЦИФРОВУ ЕПОХУ: МІЖПОКОЛІННЄВІ ВІДМІННОСТІ МІЖ ПОКОЛІННЯМИ X, Y ТА Z

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ABSTRACT

Purpose. *This article presents a theoretical and empirical analysis of personal psychological boundaries among representatives of Generations X, Y, and Z in the context of accelerating digital transformation. Drawing on frameworks from boundary psychology and generational theory, the study aimed to*

Мета. *У статті представлено теоретичний та емпіричний аналіз особистісних психологічних меж серед представників поколінь X, Y та Z в контексті цифрової трансформації. Спираючись на теорії психології меж і концепцію поколінь, дослідження мало на меті виявити*

identify intergenerational differences in the characteristics of psychological boundaries, sovereignty of psychological space, and intolerance of uncertainty, as well as to examine the relationships among these constructs within each generational cohort.

Methodology. *The study involved 128 adult respondents from Ukraine, divided into three age groups in accordance with the generational approach: Generation X (n = 34; aged 40-60), Generation Y (n = 50; aged 25-39), and Generation Z (n = 44; aged 18–24). Data were collected online using E. Hartmann's Boundary Questionnaire, Psychological Space Sovereignty Measure, and the IUS-12 Intolerance of Uncertainty Scale. Statistical analyses included the Kruskal-Wallis test, Mann-Whitney U post hoc comparisons, and Spearman correlation coefficients.*

Results. *The findings indicate that Generation X representatives exhibit higher psychological space sovereignty and "thicker" personal boundaries, whereas Generation Z demonstrates more permeable, flexible, and less integrated boundaries. Generation Y occupies an intermediate position. Statistically significant between-group differences were found for sovereignty of territory, sovereignty of personal possessions, and overall boundary thickness. Correlation analysis revealed distinct patterns of association between boundary characteristics and intolerance of uncertainty across generations: no significant correlation in Generation X, a negative association between uncertainty intolerance and habit sovereignty in Generation Y, and a positive correlation between thin boundaries and uncertainty intolerance in Generation Z. Overall intergenerational differences in uncertainty intolerance were less pronounced.*

Conclusions. *The most marked intergenerational differences concern the sovereignty of psychological space and the overall thickness of personal boundaries, whereas differences in intolerance of uncertainty are comparatively weaker. The findings carry practical implications for the design of intergenerational interaction and support programs, particularly within digital environments.*

Keywords: *Generation X, Generation Y, Generation Z, generational theory, intolerance of uncertainty, personal boundaries, psychological space sovereignty.*

міжпоколіннєві відмінності в характеристиках психологічних меж, суверенітеті психологічного простору та нетерпимості до невизначеності, а також проаналізувати зв'язки між цими конструктами в кожній поколіннєвій групі.

Методологія. *У дослідженні взяли участь 128 дорослих респондентів з України, розподілених на три вікові групи відповідно до поколіннєвого підходу: покоління X (n = 34; вік 40-60 років), покоління Y (n = 50; вік 25–39 років) і покоління Z (n = 44; вік 18-24 роки). Дані збиралися онлайн за допомогою Опитувальника меж Е. Гартманн, Шкали суверенітету психологічного простору та Шкали нетерпимості до невизначеності IUS-12. Статистичний аналіз включав критерій Краскела-Воллеса, апостеріорні порівняння за критерієм Манна-Уітні та коефіцієнти рангової кореляції Спірмена.*

Результати. *Дані свідчать про те, що представники покоління X демонструють вищий суверенітет психологічного простору та «товстіші» особистісні межі, тоді як покоління Z характеризується більш проникними, гнучкими та менш інтегрованими межами. Покоління Y займає проміжне положення. Статистично значущі відмінності виявлені щодо суверенітету території, суверенітету особистого майна та загального показника товщини меж. Кореляційний аналіз показав різні конфігурації зв'язків між межами та нетерпимістю до невизначеності по поколіннях: відсутність значущих кореляцій у поколінні X, негативний зв'язок між нетерпимістю до невизначеності та суверенітетом звичок у поколінні Y, а також позитивна кореляція між «тонкими» межами та нетерпимістю до невизначеності у поколінні Z. Міжпоколіннєві відмінності за показниками нетерпимості до невизначеності загалом виявилися менш вираженими.*

Висновки. *Найвиразніші міжпоколіннєві відмінності стосуються суверенітету психологічного простору та загальної товщини особистісних меж, тоді як відмінності в нетерпимості до невизначеності є порівняно слабшими. Результати мають практичне значення для розроблення програм міжпоколіннєвої взаємодії та підтримки, зокрема в цифровому середовищі.*

Ключові слова: *покоління X, покоління Y, покоління Z, поколіннєва теорія, нетерпимість до невизначеності, особистісні кордони, суверенітет психологічного простору.*

INTRODUCTION

In contemporary sociocultural conditions, the issue of personal boundaries and the sovereignty of psychological space has gained particular significance owing to the digitalization of everyday life, the transformation of communicative practices, and the increasing intensity of interactions between representatives of different generations. These changes in the social environment influence the way psychological space is experienced, the regulation of interpersonal distance, and conceptions of privacy, autonomy, and acceptable limits of intrusion. In this context, studying personal boundaries across different age cohorts enables a deeper understanding of the psychological mechanisms underlying intergenerational interactions, the sources of communicative difficulties, and the conditions that facilitate constructive interaction in family, educational, and professional settings.

The issue of personal boundaries in intergenerational interactions occupies a central place in contemporary personality and social psychology (Altman, 1975; Westin, 1967; Margulis, 2003; Hartmann, 1991; Mannheim, 1952). Since the configuration of the "Self-Other" boundary shapes trajectories of social perception, trust, empathy, and cooperation between age cohorts in the context of the rapid digital transformation of society (Tajfel & Turner, 1979; Pettigrew & Tropp, 2006; Putnam, 2000; van Deursen & Van Dijk, 2014; Van Dijk, 2017), research on personal boundaries has become particularly relevant.

Within phenomenological and differential psychology, boundaries are understood as a multidimensional regulatory system that filters, selects, and modulates stimuli, ensuring the integrity of the subject while preserving openness to social exchanges (Altman, 1975; Westin, 1967). In classical approaches, privacy is conceptualized as selective control over access to the self, balancing openness and closedness, and is realized through behavioral and cognitive mechanisms of interactional self-regulation (Margulis, 2003; Hartmann, 1991). In this context, the sovereignty of psychological space may be understood as the degree to which an individual maintains control over their own boundaries, habits, values, possessions, body, and social contacts.

According to E. Hartmann's continuum of "thin thick boundaries," individuals with thin boundaries are characterized by increased permeability between internal and external experience, including creativity, associativity, and a greater ease in blending the imagined and the real, whereas thick boundaries are associated with clearer stratification, stability, and a stronger need for structure in interactions (Hartmann, 1991). Some studies point to a tendency for personal boundaries to "thicken" with age across ontogenesis, a pattern associated with accumulated life experience and the formation of stable, self-protective scripts. This provides grounds for considering age and generational affiliation as factors related not only to boundary permeability but also to psychological sovereignty.

Closely related to boundaries is the construct of tolerance/intolerance of uncertainty (IU, Carleton et al., 2007), which reflects a stable cognitive-affective tendency to perceive ambiguous situations as threatening, thereby increasing anxiety, caution, and risk avoidance (Buhr & Dugas, 2002; Dugas et al., 2001). Empirical evidence demonstrates associations between IU and boundary regulation strategies, including a preference for more structured modes of interaction and lower readiness for cross-group contact under conditions of informational uncertainty (Carleton et al., 2012). Conversely, greater tolerance of uncertainty promotes interpersonal flexibility and acceptance of "otherness," which, in an intergenerational context, may manifest as a

greater willingness to negotiate boundaries, experiment with new communication channels, and resolve conflicts constructively (Bomyea et al., 2015).

The absence of statistically significant intergenerational differences in intolerance of uncertainty requires additional contextualization. Data were collected in Ukraine in November 2024, that is, under conditions of prolonged martial law, continuing security threats, forced educational adaptation, and accumulated experience of distance or blended learning.

In such circumstances, intolerance of uncertainty may be shaped less by generational affiliation and more by a shared macro-social context. War-related uncertainty affects all age cohorts simultaneously: students, teachers, parents, and working adults are all exposed to disrupted routines, safety risks, unpredictable schedules, displacement, and emotionally loaded information flows.

This may explain why intolerance of uncertainty was relatively high and weakly differentiated across the three generations in the present sample. In other words, the wartime context could have levelled or attenuated generational differences by creating a common background of chronic unpredictability. Recent Ukrainian studies support this interpretation. Research on Ukrainian university students during the war demonstrates a high prevalence of depression, anxiety, sleep problems, and post-traumatic stress symptoms, as well as a negative association between these mental health problems and academic performance (Pinchuk et al., 2025).

Similarly, Korda et al. (2025) emphasize that war-related stressors affect both psychological well-being and academic functioning among Ukrainian students. Therefore, in the present study, the lack of pronounced intergenerational differences in intolerance of uncertainty should not be interpreted as evidence that uncertainty is irrelevant to generational boundary formation. Rather, it may indicate that wartime conditions operate as a powerful contextual moderator, raising the general level of uncertainty-related tension across all groups.

The theoretical background of the present study is informed by generational theory and Mannheim's classical conception of generations as "historically situated" cohorts (Mannheim, 1952). Against this backdrop, Generations X, Y, and Z demonstrate distinct communicative repertoires and technological profiles: from the relatively "analog" environment of Generation X (Gen X), through the digitally enriched environment of Generation Y (Gen Y), to the fully mediatized everyday life of Generation Z (Gen Z), often described through the concept of digital natives (Prensky 2001; van Deursen & van Dijk 2014). Importantly, these structural differences in the trajectories of "socialization with technology" may mediate the configuration of boundaries, including their degree of permeability, access regimes, and "protocols" of interaction, as well as the level of psychological space sovereignty and threshold levels of acceptable uncertainty in intergenerational contact (van Deursen & van Dijk, 2014; Venkatesh et al., 2003).

From a social-psychological perspective, intergenerational relationships are shaped by the dynamics of intergroup interactions. Social identity theory explains the tendency toward in-group favoritism and heightened sensitivity to out-group differences (Tajfel & Turner, 1979), thereby activating defensive scripts in "older–younger" interactions. The contact hypothesis suggests that systematic positive contact under conditions of reduced status imbalance and shared goals decreases prejudice (Pettigrew & Tropp, 2006).

However, in contemporary urbanized contexts, opportunities for regular intergenerational interactions are narrowing (Putnam, 2000). Consequently, without purposeful interventions, privacy-related barriers, whether linguistic, symbolic, or instrumental, may become entrenched and reproduce a cycle of distrust.

The technological environment acts as a key moderator of this dynamic. Research on intergenerational ICT programs shows that technology-mediated interaction reduces instrumental barriers (e.g., lack of skills, fear of errors), expands communication through visual, multimodal, and asynchronous formats, and creates emotionally safe contexts in which personal boundaries can be negotiated without threatening integrity (Döring et al., 2019; Phang et al., 2023, 2022; Döring et al., 2022).

In digital skills training projects, older participants report increased self-efficacy, reduced social isolation, and greater readiness for sustained online contact, while younger participants gain mentoring and caregiving experience, fostering intersubjective recognition of the other generation (López Seguí et al., 2019; Phang et al., 2023). Evidence from the use of communication platforms (e.g., video calls, messaging, shared media) further indicates that digital mediation strengthens intergenerational connectedness, while age-adapted design enhances older adults' sense of control over personal boundaries and reduces perceived dependence (Döring et al., 2022; Oliveira et al., 2022).

The relevance of the present study is determined by three factors. First, a demographic shift: the proportion of older adults is increasing, while accelerated digitalization raises the demand for technologies that inclusively connect generations (van Deursen & van Dijk, 2014; Putnam, 2000). Second, psychological and social conditions: the pandemic and wartime crises have heightened background uncertainty, affecting boundary regulation and complicating intergenerational understanding (Carleton et al., 2012).

At the same time, digital platforms function as a core infrastructure of social interaction, enabling the construction of contexts for negotiating personal boundaries (Döring et al., 2022; Oliveira et al., 2022). Third, a methodological gap: there is a lack of integrated models that jointly consider personal boundaries, intolerance of uncertainty, and technological mediation as interrelated mechanisms of intergenerational relations (Hartmann, 1991; Venkatesh et al., 2003).

In addition, empirical studies comparing Generations X, Y, and Z rarely examine, within a single design, the sovereignty of psychological space, boundary thickness/permeability, and intolerance of uncertainty, as well as the relationships among these variables within each cohort. This gap defines the rationale for the present study.

This study aimed to identify intergenerational differences in indicators of psychological space sovereignty, thickness/permeability of personal boundaries, and intolerance of uncertainty among representatives of Generations X, Y, and Z, and to analyze the relationships among these variables within each group.

Accordingly, the following hypotheses were formulated:

1. Representatives of Gen X would demonstrate higher levels of psychological space sovereignty than representatives of Generations Y and Z.
2. Representatives of Gen Z are characterized by thinner and more permeable personal boundaries than those of Generations X and Y;

3. The relationships among personal boundary characteristics, psychological space sovereignty, and intolerance of uncertainty would differ across Generations X, Y, and Z.

METHODOLOGY

Participants

The study involved 128 adult respondents from Ukraine who were recruited on a voluntary basis. Participants were recruited through the online dissemination of a Google Forms questionnaire in November 2024. The inclusion criteria were legal adulthood, residence in Ukraine, provision of informed voluntary consent, and completion of the questionnaire.

Participants were assigned to three groups according to the age criteria of generational theory: Gen X (n = 34; 40-60 years), Gen Y (n = 50; 25-39 years), and Gen Z (n = 44; 18-24 years). Women comprised 64% of the sample. The study was conducted in accordance with the generally accepted ethical principles for research involving human participants as set forth in the Declaration of Helsinki. No group or individual manipulations were employed, and data confidentiality was ensured.

Measures

Three standardized instruments were used to assess personal boundaries.

1. Hartmann's Boundary Questionnaire is a psychometric instrument (Hartmann, 1991) designed to assess the "thickness" or "thinness" of psychological boundaries.
2. Psychological Space Sovereignty measure consists of six scales, each assessing the respondent's tendency to protect a specific domain of personal space: the physical body, private territory, personal possessions, habits, social ties, and values (Volynchuk, 2022).
3. The Intolerance of Uncertainty Scale, short form (IUS-12) is a brief version of the original instrument (Carleton et al., 2007), adapted into Ukrainian (Hromova, 2021). It comprises two subscales, prospective anxiety and inhibitory anxiety, and reflects a negative response of uncertainty and ambiguity.

All instruments have previously demonstrated reliability and validity in populations comparable to the present sample, including samples of Ukrainian adolescents and adults.

Procedure

Data were collected online using Google Forms in November 2024. Participants were informed of the study's general topic without disclosing the specific hypotheses to reduce expectancy effects.

The data were analyzed using quantitative statistical methods in the SPSS software. The Kolmogorov–Smirnov test was used to assess the distribution of variables. In light of the distributional results, the nonparametric Kruskal-Wallis test (H) was used to examine between-group differences, the Mann-Whitney U test was applied for pairwise comparisons, and Spearman's rank-order correlation coefficient was used to assess the associations among the variables.

The level of statistical significance was set at $p < .05$. Results with p-values greater than .05 were not interpreted as statistically significant. Values close to the conventional threshold were treated only as descriptive findings and interpreted with caution.

Effect sizes were additionally calculated to assess the practical significance of the observed differences. For the Kruskal-Wallis test, eta-squared based on the H statistic (η^2H) was used. For pairwise Mann-Whitney U comparisons, rank-biserial correlation (r) was calculated as an effect size. Effect sizes were interpreted as small, moderate, or large according to conventional benchmarks.

RESULTS

Descriptive Statistics

In the first stage of the analysis, the mean scores on all scales of personal boundaries and intolerance of uncertainty were compared across the three groups (X, Y, and Z).

The overall results are presented in Table 1 and Figure 1. The table and figure indicate the direction of the between-group differences: Gen X obtained the highest scores on the psychological space sovereignty scales. In contrast, Gen Z demonstrated the lowest mean scores on these scales, indicating that their boundaries were, on average, the most open and flexible. Gen Y occupied an intermediate position, although on some scales, it was closer to Gen X and on others to Gen Z.

Table 1

Mean values of personal boundary indicators and tolerance of uncertainty across Generations X, Y, and Z

Scale / Indicator	Gen X	Gen Y	Gen Z
SPB	8,50	8,29	7,86
ST	9,56	9,08	7,68
SP	11,32	9,47	9,64
SH	9,41	8,65	7,95
SST	4,79	4,47	4,25
SV	10,00	8,84	8,80
Boundaries	48,38	50,69	53,91
Anxiety	38,00	38,71	39,75
PA	24,32	24,29	24,27
IA	13,68	14,41	15,48

Note. SPB – sovereignty of the physical body, ST – sovereignty of territory, SP – sovereignty of possessions, SH – sovereignty of habits, SST – sovereignty of social ties, SV – sovereignty of values; PA – prospective anxiety; IA – inhibitory anxiety.

As shown in Table 1, the integral boundaries score on Hartmann's questionnaire increases from Gen X to Gen Z: it is lowest in Gen X (48.4 points), corresponding to "thicker" boundaries, and highest in Gen Z (53.9 points), indicating a tendency toward "thinner" boundaries. Gen Y showed an intermediate value (50.7). Thus, at the descriptive level, the data reveal a trend consistent with the hypothesis of generational change in the personal boundaries.

Figure 1

Mean subscale scores for psychological space sovereignty across Generations X, Y, and Z.

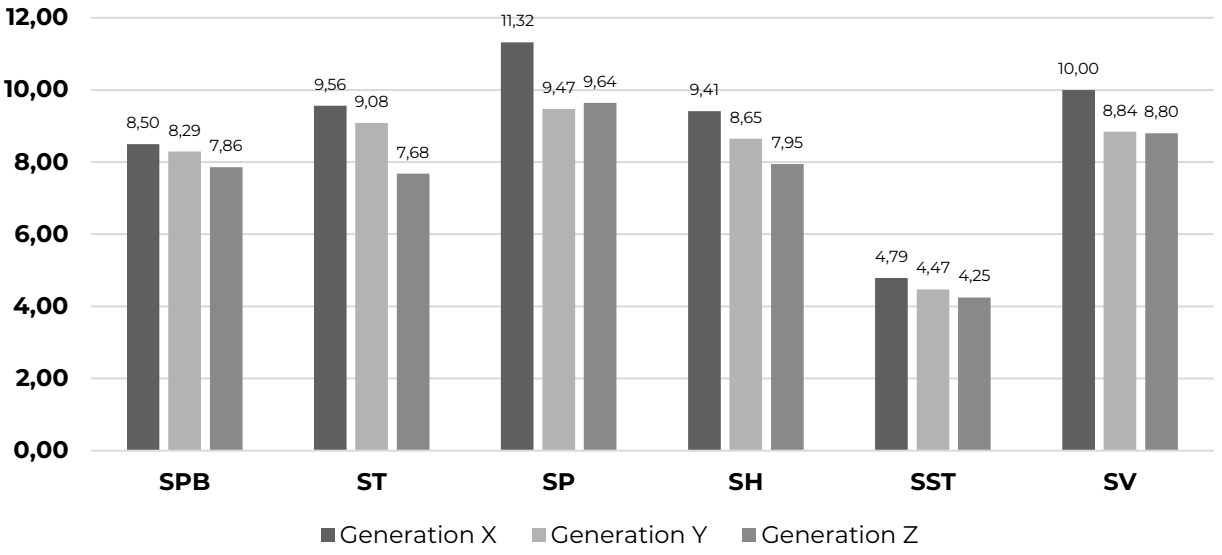

Figure 1 reflects the same pattern of differences: Gen X (yellow bars) shows higher mean scores on all reported scales than younger generations, indicating a tendency toward more rigid personal boundaries. Gen Z (pink bars) had the lowest scores, indicating the most flexible and permeable boundaries. Gen Y (orange bars) occupies an intermediate position in this regard.

To test the statistical significance of the observed between-group differences, the Kruskal–Wallis test (H) was applied to all indicators.

Table 2

Kruskal–Wallis test (H) for each indicator

	SPB	ST	SP	SH	SST	SV	Boundaries	Anxiety	PA	IA
H	1.006	10.091	7.769	5.360	1.432	4.021	11.392	0.936	0.132	4.562
p	.605	.006	.021	.069	.489	.134	.003	.626	.936	.102
η^2H	.000	.065	.046	.027	.000	.016	.075	.000	.000	.020

Note. *SPB – sovereignty of the physical body, ST – sovereignty of territory, SP – sovereignty of possessions, SH – sovereignty of habits, SST – sovereignty of social ties, SV – sovereignty of values; PA – prospective anxiety; IA – inhibitory anxiety. η^2H – effect size for the Kruskal–Wallis test.*

The Kruskal–Wallis test revealed statistically significant intergenerational differences in the selected variables.

The effect size analysis showed that the strongest effects were observed for the integral boundary score, $\eta^2H = .075$, and sovereignty of territory, $\eta^2H = .065$, both corresponding to a moderate effect. Sovereignty of possessions demonstrated a small-to-moderate effect, $\eta^2H = .046$.

The remaining indicators showed small or negligible effects, which supports the conclusion that the most practically meaningful intergenerational differences concerned territorial sovereignty and the overall thickness of psychological boundaries.

– Specifically, statistically significant results were obtained for the following:

- Sovereignty of territory (ST): H = 10.09, p = .006, η^2H = .065. The highest values were observed in Gen X, and the lowest in Gen Z.
- Sovereignty of possessions (SP): H = 7.769, p = .021, η^2H = .046. Higher scores were characteristic of Gen X compared with the younger groups.
- Boundaries: H = 11.392, p = .003, η^2H = .075. The integral score was highest in Gen Z and lowest in Gen X, corresponding to "thinner" boundaries in the younger group.

For the remaining indicators, the Kruskal–Wallis test did not reveal statistically significant overall between-group differences at $p < .05$.

The overall differences identified by the Kruskal–Wallis test required clarification of which specific groups differed significantly from each other. A post hoc analysis of pairwise comparisons using the non-parametric Mann–Whitney U test provided a more detailed picture. Table 3 includes only those comparisons that remained statistically significant after correction for multiple comparisons.

Table 3

Significant post hoc results based on the Mann–Whitney U test after correction for multiple comparisons

Group	Scale	U	p	r	Direction of difference
X – Y	SP	563.5	.006	.34	X > Y
Y – Z	ST	801.0	.016	.27	Y > Z
	Boundaries	787.5	.012	.28	Z > Y
X – Z	ST	460.5	.004	.38	X > Z
	Boundaries	436.0	.002	.42	Z > X

Note. *ST – sovereignty of territory; SP – sovereignty of possessions. r – rank-biserial correlation used as an effect size for Mann–Whitney U comparisons.*

Pairwise effect sizes showed that the most pronounced practical differences were found between Generations X and Z. The X–Z comparison demonstrated moderate effects for sovereignty of territory (r = .38) and the integral boundary score (r = .42). The X–Y difference in sovereignty of possessions also showed a moderate effect (r = .34), whereas the Y–Z differences in sovereignty of territory and boundary thickness were smaller, approaching a moderate magnitude (r = .27 and r = .28, respectively).

The largest differences were observed between Generations X and Z. Representatives of Gen X demonstrated significantly higher scores on sovereignty of territory (ST) compared to Gen Z. A statistically significant difference was also found for the integral boundaries indicator: Gen Z exhibited higher scores, indicating "thinner" psychological boundaries, whereas Gen X showed comparatively "thicker" boundaries. No other indicators, including intolerance of uncertainty, differed significantly between these groups after correction for multiple comparisons.

In contrast, Generations X and Y appeared largely similar. A significant difference was identified only for sovereignty of possessions (SP), with higher scores observed in Gen X, suggesting greater protection of personal belongings. No significant differences were found for the remaining sovereignty indicators.

The comparison between Generations Y and Z revealed differences primarily in sovereignty of territory and the integral boundaries indicator. Gen Y scored significantly

higher on ST, while Gen Z again demonstrated higher boundary scores, reflecting greater permeability. Other sovereignty dimensions did not show statistically significant differences.

At the same time, intolerance of uncertainty did not differentiate between Generations Y and Z: no significant differences were found either for the total IUS-12 score or for its subcomponents, indicating comparable levels of anxiety in response to uncertainty across these cohorts.

Correlation Analysis

The next step was to examine how the indicators of personal boundaries and tolerance of uncertainty are related within each generational group. To this end, Spearman correlation coefficients were calculated separately for the main scales in samples X, Y, and Z samples. It was assumed that the pattern of these interrelationships might differ across generations because of differences in life experience and socialization.

In Gen X, the correlation analysis did not reveal statistically significant associations between the integral indicator of personal boundaries and the level of intolerance of uncertainty ($r = -0.10$, $p > .10$). Likewise, none of the psychological space sovereignty subscales demonstrated substantial correlations with the intolerance of uncertainty subscales (all $|r| < .25$, $p > .10$). This may suggest that, for representatives of Gen X, the rigidity or flexibility of personal boundaries is not directly related to the extent to which they fear uncertainty in their lives. In other words, a person from Gen X may have firm boundaries while exhibiting either a high or low level of anxiety in the face of the unknown, and vice versa. It may be assumed that, in this age group, other factors, such as life experience or professional status, exert a stronger influence on tolerance of uncertainty than do the structural characteristics of personality.

In Gen Y, several significant correlations emerged, indicating a relationship between boundaries and uncertainty. In particular, a negative correlation was found between the level of intolerance of uncertainty and the indicator of sovereignty of habits (SH) ($r = -0.34$, $p < .05$). This may suggest that among Millennials, those who tolerate uncertainty less well, that is, those who are more intolerant of it, tend to have more rigid boundaries in the domain of everyday habits and routines and place greater value on stability in their daily schedules and rituals. One possible explanation is that Gen Y members who experience anxiety in response to uncertainty attempt to compensate by imposing order on their lives and constructing clear frameworks and routines to feel safer. This relationship is consistent with the assumption that uncertainty in the external world may prompt individuals to reinforce their personal boundaries to gain more control.

In addition, the correlation between the integral boundaries score and tolerance of uncertainty in Gen Y approached the conventional threshold of statistical significance, but did not formally reach it ($r = -0.27$, $p = .051$). Therefore, this result was not interpreted as statistically significant. At the same time, the direction of the coefficient may be considered descriptively informative, as it is consistent with the broader pattern observed in Gen Y: boundary regulation in this cohort may be connected with attempts to manage uncertainty through greater structure and predictability. However, this observation should be treated as preliminary and requires further verification in larger and more balanced samples.

The most interesting results were obtained for Gen Z. In this group, several significant correlations were identified that differed from the pattern observed in other

generations. First, a positive correlation was found between the integral boundaries indicator (Hartmann) and intolerance of uncertainty ($r = +0.41$, $p < .01$). In other words, in the youngest generation, "thinner" boundaries were associated with higher anxiety in the face of uncertainty during the pandemic. At first glance, this appears unexpected, as one might assume that more open individuals would respond to the unknown more easily. However, our data indicate the opposite: Gen Z representatives with the most permeable boundaries show greater concern about uncertainty. This relationship may suggest that excessively thin boundaries are associated with greater vulnerability: when a young person remains open to external influences, they become more sensitive and more anxious in response to unpredictable events.

Second, Gen Z showed reduced internal coherence across boundary aspects. Correlations among the subscales of psychological space sovereignty were weaker in this group (mean $|r| \sim .20$) than in Gen X (mean $|r| \sim .45$). This may suggest that the structure of personal boundaries in Gen Z is more complex. For example, a young person may have open physical boundaries, experiencing little discomfort from close contact, while maintaining rigid value-related boundaries and not accepting others' views, or vice versa. In contrast, in the older generation, all aspects of boundaries tend to "move together": if a person guards their possessions, they are also likely to regulate physical distance, routine, and circle of communication consistently. Such coherence is less characteristic of younger individuals, whose boundaries appear more situational and context-dependent.

DISCUSSION

The present study found that younger generations exhibit less clearly defined and more flexible personal boundaries compared to older generations. The most pronounced contrast was observed between the two extreme groups, Gen X and Gen Z. This provides grounds for interpreting the observed differences as generational specificities in the organization of self-boundaries under conditions of differing socialization experiences Importantly, the effect size analysis showed that the observed intergenerational differences were not merely statistically significant but also practically meaningful, although their magnitude was generally small to moderate rather than large. This suggests that generational affiliation contributes to differences in psychological space sovereignty and boundary permeability, but it should not be interpreted as the sole or dominant determinant of these characteristics.

In our sample, Gen X representatives demonstrated clear and consistent personal boundaries. They showed higher levels of psychological space sovereignty, more strongly defended the inviolability of personal space, and were more likely to preserve the stability of habits and social surroundings; in other words, their sense of self appeared to be more protected from external influences. This interpretation is consistent with work by Western authors on Gen X, who emphasize its independence and orientation toward autonomy, and who sometimes describe it as a "latchkey generation" that values personal time and space.

Gen Z, by contrast, Gen Z showed the opposite pattern: their personal boundaries were the most permeable and changeable. Our data show reduced sovereignty scores across all domains, from bodily to value-related. In practical terms, this means that a typical young person may be more likely to allow intrusion into personal space, be less reactive to crowding or physical contact, adopt a more flexible attitude toward routines and rules, be more open in the sphere of social ties, and show greater openness in the

value domain by reconsidering or questioning their established beliefs. This configuration of results may be interpreted as reflecting the greater contextuality and plasticity of personal boundaries in the youngest group. This interpretation is consistent with findings suggesting that Gen Z develops in a globalized networked environment in which geographical, informational, and social boundaries are more permeable (Towner et al., 2022).

Recent research on Generation Z in digital learning environments provides an important educational context for interpreting these findings. Although studies directly examining Hartmann's construct of "thin boundaries" in prolonged distance education remain limited, adjacent evidence on digital learning, privacy, self-disclosure, and online interaction is highly relevant. Contemporary higher education research describes Gen Z as an "always-connected" cohort that is highly responsive to multimedia and technology-supported learning environments, but at the same time requires a balance between independent learning and meaningful interpersonal interaction (Rylance-Graham & Ismail, 2026). This is consistent with the present finding that Gen Z demonstrates more permeable and less internally coherent boundaries: such permeability may function as an adaptive resource in flexible, multimodal, and networked learning environments, but it may also increase vulnerability to cognitive and emotional overload.

In this regard, the "thinness" of Gen Z boundaries should not be interpreted only as psychological weakness or immaturity. Rather, it may reflect a mode of adaptation to a learning ecology in which communication, academic tasks, peer interaction, and self-presentation are constantly mediated through digital platforms. Online lectures, learning management systems, chats, video meetings, and social media create a situation in which the boundaries between personal space, educational space, and social space become blurred. Therefore, the lower sovereignty of territory and the higher permeability of personal boundaries observed in Gen Z may be understood as part of a broader transformation of educational subjectivity in the digital age.

At the same time, recent findings on Gen Z's online privacy and self-disclosure suggest that openness in digital environments is ambivalent. Rózsa et al. (2024) showed that Gen Z's willingness to disclose personal information on social media is influenced by interpersonal and reference-group factors, while social isolation and anxiety are also relevant to understanding online self-disclosure. This supports the interpretation of the present results as an "open but vulnerable" configuration: Gen Z students may be more willing to communicate, share, and participate in digital interaction, yet this openness can coexist with heightened sensitivity to uncertainty, external evaluation, and perceived intrusion into personal space.

It is also important to note that Gen Z displayed weaker coherence across different aspects of boundaries. These features may indicate a more differentiated and less-integrated boundary structure. In other words, the personality coherence characteristic of older generations appears to be less pronounced in this group, while boundaries are more strongly influenced by situational and contextual factors. On the one hand, this may provide an adaptive advantage through flexibility, creativity, and the ability to live "in the moment." However, such fluid boundaries may complicate the formation of a stable sense of self and security. This interpretation does not imply that "fragmented identity" was directly measured in the present study; however, it is consistent with descriptions of younger digital cohorts in contemporary literature.

Gen Y demonstrated intermediate characteristics in this regard. On most scales, their scores fell between those of Generations X and Z, suggesting that Millennials have partly inherited a respect for privacy from their parents, as reflected, for example, in their still relatively high valuation of personal possessions and territory, where the differences between Y and Z were statistically significant. Simultaneously, they have acquired characteristics associated with the digital era, including lower sovereignty scores than Gen X, particularly in relation to physical space and social ties. These findings may reflect an intermediate or transitional profile of personal boundaries. Their personal boundaries are generally more flexible than those of the older generation; however, they still retain a certain degree of structure and integration. This balance is evident, among other things, in the fact that Gen Y did not display the same degree of diffusion as Gen Z: the boundary subscales were moderately correlated, suggesting a partially integrated boundary structure. Thus, Millennials appear to demonstrate relatively balanced boundaries: they are no longer as closed as Gen X but not as diffuse as Gen Z. This interpretation is broadly consistent with the view of Gen Y as a cohort that combines elements of both analog and digital social experiences.

Notably, there were no intergenerational differences in the tolerance of uncertainty. Overall, all groups demonstrated low tolerance. This result may be interpreted as indicating relative stability in the intolerance of uncertainty across generations within the present sample. One possible explanation is that, in this case, the generational factor may be outweighed by broader contemporary social conditions: the modern world, characterized by objectively high levels of uncertainty due to pandemics, wars, and economic crises, affects all individuals, regardless of age. For example, the COVID-19 pandemic led to a sharp increase in anxiety across age groups, and war and other major disruptions may bring psychological responses closer (Santabárbara et al., 2021). Thus, our sample, collected in 2024, may reflect a generally elevated background level of intolerance to uncertainty in society. It is also possible that a clearer difference in tolerance of uncertainty would emerge if more widely separated age categories were compared. This warrants further investigation. In particular, it would be of interest to include Baby Boomers (born approximately 1946-1964) and even Generation Alpha (children born after 2010).

Particular attention should be paid to the relationship between personal boundaries and tolerance of uncertainty. In this respect, our results revealed different configurations of associations across the three generations. In Gen X, the absence of any association between boundaries and uncertainty may suggest that their rigid boundaries represent a stable mode of self-regulation not necessarily linked to personal anxiety. They appear to establish boundaries based on values or habits rather than out of fear of the unknown. This explanation is consistent with the obtained result and does not contradict earlier assumptions regarding the relative autonomy of the structural characteristics of personal boundaries.

In Gen Y, a logic of “uncertainty leading to a striving for control” becomes apparent primarily at the level of everyday habits and routines. Millennials who experience greater discomfort with uncertainty may rely more strongly on stable daily patterns, predictable routines, and habitual forms of self-organization. The basis for this interpretation lies in the statistically significant negative association between intolerance of uncertainty and sovereignty of habits. This mechanism is consistent with the concept of intolerance of uncertainty as a driver of a need for certainty: individuals who cannot tolerate the unknown attempt to create predictability wherever possible, for example, by establishing strict rules in everyday life or at work.

The most complex case is Gen Z, with its unexpected positive correlation pattern: "open, yet anxious." In our study, this was reflected in a positive relationship between "thin" boundaries and intolerance of uncertainty. One possible interpretation involves the phenomenon of vulnerability through openness. Young people with thin boundaries are likely to be excessively involved in external information flows and less protected from negativity, social problems, and collective anxieties. As a result, they may react more acutely to threats and uncertain factors because their sense of self lacks a robust protective layer. For example, a young person who is constantly present on social media, openly shares personal experiences, and consumes the experiences of others may feel more overloaded and more anxious about the future than a peer who maintains a greater distance and restricts information intake.

This creates a paradox: those who are least isolated from the world may feel the least protected in the face of its uncertainty. Such an interpretation is consistent with Hartmann's findings that thin-boundary individuals are more vulnerable to certain forms of anxiety and nightmare experiences. Thin boundaries have also been associated with the trait of "insecurity in relationships," that is, a tendency toward anxious attachment. Taken together, these observations suggest that complete openness, despite its advantages, may also entail disadvantages, such as heightened psychological vulnerability, which was most clearly manifested in the Gen Z sample.

The practical significance of these findings lies in the fact that different generations may require different formats of support and interaction, including in digital environments. This is consistent with evidence on the effectiveness of intergenerational ICT programs in which younger and older participants mutually exchange resources and experience, thereby promoting greater confidence, engagement, and satisfaction with interaction (López Seguí et al., 2019). Likewise, the present results correspond to findings on the important role of digital media in sustaining and expanding intergenerational ties, particularly by maintaining regular communication and improving the quality of contact between members of different age groups (Döring et al., 2022).

The findings also have direct implications for educational practice, especially in online and blended higher education. Psychological boundaries in education are not abstract personality characteristics only; they are manifested in concrete academic situations: whether students feel comfortable keeping cameras on during online classes, how they respond to constant messages in group chats, how they experience deadlines and unclear instructions, how they participate in group projects, and how they negotiate the boundary between home, private life, and academic visibility.

For Gen Z students, thinner and more permeable boundaries may facilitate openness to collaborative digital formats, peer interaction, rapid switching between communication channels, and flexible forms of learning. However, the same boundary configuration may also increase vulnerability to overload, excessive involvement in digital communication, anxiety about external evaluation, and difficulties in protecting personal time and space. In distance learning, this may appear as fatigue from constant online availability, discomfort with compulsory visual presence, tension in group chats, or difficulty separating academic demands from private life.

Intolerance of uncertainty is also educationally significant. In academic settings, uncertainty is present in open-ended tasks, changing schedules, ambiguous assessment criteria, delayed feedback, and the need to choose an individual educational trajectory. Students with higher intolerance of uncertainty may experience

such situations as threatening, which can reduce motivation, increase avoidance, complicate decision-making, and negatively affect academic performance. Therefore, educational environments for Gen Z should combine flexibility with predictability: clear instructions, transparent assessment criteria, staged deadlines, stable communication rules, and psychologically safe opportunities for choice.

The concept of psychological space sovereignty also allows rethinking academic freedom in the digital age. For students, academic freedom is not limited to the choice of courses or learning paths; it also includes the right to regulate one's digital presence, personal learning space, communicative availability, and degree of self-disclosure in educational interaction. From this perspective, "digital conflicts" in higher education often emerge as boundary conflicts: disagreements about cameras, response time, chat etiquette, group workload, public criticism, or the use of personal data and AI tools. Such conflicts should be addressed not only administratively, but also pedagogically, through explicit digital communication protocols, negotiated expectations, and respect for students' personal space.

Thus, the results of the present study indicate that generational differences in personal boundaries and in the ways people experience uncertainty may be important for the design of intergenerational interaction programs. For example, shared projects involving smartphones, joint online training, games, or virtual museum tours may foster empathy and mutual understanding: older adults become acquainted with new media, while younger people come to value the experience of older generations. In this sense, our findings, together with previous research, suggest that such steps may strengthen social ties and reduce intergenerational distance.

Study Limitations

The study is subject to several limitations.

First, the sample was restricted to three cohorts (X, Y, Z) and does not fully capture within-generation heterogeneity, as personal boundaries are also shaped by cultural, familial, and individual temperamental factors. Although diverse, the sample was not statistically representative (e.g., slight overrepresentation of women), which limits generalizability. Future research should incorporate broader and more balanced samples, accounting for gender, cultural context, and socio-demographic variables.

Second, the cross-sectional design precludes definitive interpretation of observed differences as generational, as they may reflect age-related or situational influences. Longitudinal and sequential cohort designs are required to disentangle cohort, age, and contextual effects.

Third, the measurement instruments have inherent constraints. Hartmann's questionnaire, while widely used, is relatively broad and may not fully capture the multidimensionality of personal boundaries; this was partially mitigated by including the Psychological Space Sovereignty measure. The Intolerance of Uncertainty Scale assesses a general dispositional tendency and may not reflect domain-specific variations, which could yield different empirical patterns.

CONCLUSIONS

Empirically, the study established that Generations X, Y, and Z differ primarily in selected parameters of psychological space sovereignty and in the overall "thickness" of personal boundaries. The most pronounced differences were found for sovereignty of territory, sovereignty of possessions, and the integral boundaries indicator. Effect size

estimates confirmed that the most practically meaningful differences concerned the integral boundary score and sovereignty of territory, with small-to-moderate effects, whereas the remaining differences were weaker or statistically non-significant.

Representatives of Gen X were characterized by higher levels of sovereignty, whereas those of Gen Z demonstrated "thinner," more permeable personal boundaries. At the same time, intergenerational differences in intolerance-of-uncertainty indicators were substantially weaker and did not reach statistical significance for most measures. In addition, the configuration of relationships between personal boundaries and intolerance of uncertainty was found to differ across Generations X, Y, and Z.

The study clarified that personal boundaries constitute a multidimensional construct encompassing physical, emotional, intellectual, and social levels of self-protection. Their function lies in maintaining an optimal balance between closeness and distance, autonomy and interaction. The obtained results provide grounds for interpreting personal boundaries as a psychological system sensitive to differences in socialization and life experience. Theoretical analysis suggests that changes in the social and cultural environment can transform the nature of personal boundaries. In particular, generational affiliation influences how individuals construct barriers or bridges between themselves and the world.

In this context, the higher sovereignty observed in Gen X may be interpreted as an indicator of a more structured and protected organization of boundaries, whereas the "thinner" boundaries of Gen Z may reflect greater flexibility, contextuality, and permeability of personal space. At the same time, the absence of pronounced intergenerational differences in intolerance of uncertainty suggests that this indicator is likely determined less by generational affiliation per se than by current social conditions or other individual factors.

Directions for Future Research

The findings open several avenues for future research. First, it would be useful to broaden the age range and include additional generations, such as the Baby Boomers and Generation Alpha, to provide a more comprehensive picture of the evolution of personal boundaries in the twentieth and twenty-first centuries. Second, cross-cultural comparative analysis would be of considerable interest: do the observed tendencies persist across different countries and cultures, particularly beyond the Western world? This would make it possible to distinguish the influence of age affiliation itself from that of the broader cultural context. Third, longitudinal studies are needed to determine how personal boundaries change over the life course within a single generation; for example, whether the boundaries of today's Gen Z will "harden" as they grow older or remain relatively flexible, which would provide stronger evidence for the stability of a generational effect.

CONFLICT OF INTEREST

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