

Can Cyber-Hugs Replace Real-World Warmth? A Study on the Psychological Mechanism of Virtual Social Compensation Among Generation Z College Students

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Abstract

Generation Z college students are experiencing a profound social paradox: virtual connections are unprecedentedly extensive, yet real-world loneliness keeps spreading. Based on Compensation Theory, Social Comparison Theory and Parasocial Interaction Theory, this study systematically analyzes the occurrence mechanism and psychological path of virtual social compensation. The study finds that frustrated real-world social demands constitute the "push force" for compensation; the anonymity, instant feedback and spatial design of virtual environments constitute the "pull force" for compensation; and individual differences such as field cognitive-style determine how easily compensation can be activated. The compensation effect presents three differentiated paths: substitutive satisfaction provides short-term emotional buffering; the paradox of "more compensation brings greater loneliness" within a vicious circle is jointly driven by upward social comparison and the degradation of real-world social skills; empowerment spillover needs to be understood under the framework of spectrum dynamic demands — compensation swings among three states of "sanctuary-sandbox-bridge", and positive transfer can only be realized under the "bridge" state. The demarcation of boundaries depends on the level of self-differentiation, the depth of compensation content and real-world ecological support. This paper holds that the governance approach for virtual social compensation lies not in cutting off connections, but in guiding compensation to upgrade from "emotional consumption" to "social practice".

Keywords

Virtual social compensation; Generation Z; social comparison; parasocial interaction; spectrum dynamic demands.

1. Introduction

Generation Z college students are currently confronted with a prominent social contradiction. As the generation most broadly "connected" empowered by digital technologies, they also suffer from the most prominent real-world loneliness. The "scissors-gap" pattern formed by rising online social hours and shrinking offline social competence constitutes the core tension in the emotional life of contemporary youth. Against this backdrop, whether "cyber-hugs" — referring to various compensatory social behaviors for emotions in virtual spaces — act as a "painkiller" for deficient real-world social interactions or a "poison" leading to continuous atrophy of real-world social competence, has become a theoretical proposition calling for urgent responses.

Surveys show that nearly half of young people report feeling lonely from time to time, and the 18-to-22-year-old group falls into the highest-risk bracket. Active Generation Z online users have reached 342 million, and mobile social activities account for 28.5 % of their total online duration. The vigorous development of social media has not deepened interpersonal bonds;

instead, it has given rise to the prevalent feeling of "alone-together": people maintain increasingly close contacts online while growing lonelier in reality.

Within this structural tension, virtual social compensation is accelerating among Generation Z. Virtual social compensation refers to the behavioral tendency in which individuals turn to online virtual interactions for emotional compensation when their real-world social demands fail to be adequately satisfied. From tens-of-thousands-of-messages replies of "Thank you, mom and dad" in comment sections of "electronic-parents" videos, to sustained dialogues by tens-of-millions-of-active users of AI lovers; from college students' reliance on the sense of companionship brought by "cloud deskmates" in virtual study rooms, to young people's symbolic control over uncertain fate in "cyber metaphysics" — these scattered phenomena point to one underlying logic: virtual spaces are becoming "alternative facilities" for emotional gratification of Generation Z college students[1].

Nevertheless, virtual social compensation is not a homogeneous process. It may lead to completely different psychological consequences for different individuals: some obtain temporary emotional comfort, some fall into the vicious circle of "more compensation brings greater loneliness", and others transfer communication confidence acquired from virtual socializing to real-world interactions. Understanding this differentiation mechanism constitutes the core concern of this research.

Combining the intersections of Compensation Theory, Social Comparison Theory and Parasocial Interaction Theory, this paper systematically explores three questions: What are the triggering conditions for virtual social compensation? What differentiated paths of psychological effects does such compensation produce? Which boundary conditions determine the direction of compensation? After clarifying the above-mentioned questions, this paper can provide theoretical references for understanding and intervening in virtual social compensation among college students in the digital era.

2. Definition of Core Concepts

2.1. Social Portrait of Generation Z College Students

Generation Z generally refers to people born between 1995 and 2009 who have grown up immersed in a thoroughly digital environment. Their social characteristics can be divided into three categories.

First, loneliness spreads structurally. Among all age groups, Generation Z shows the most obvious loneliness. This group is in "emerging adulthood", the transitional developmental stage from adolescence to adulthood, and typically features identity exploration, unstable conditions and self-focus. Their inner tug between expecting deep social bonds and feeling weary of the responsibility requirements attached to traditional social modes forms the psychological foundation for compensation.

Second, Generation Z college students show an overall declining willingness for real-world socializing. They often experience "social stuttering" in daily social interactions and bear emotional consumption. Goffman's Dramaturgy Theory mentions that individuals must continuously conduct impression management in daily socializing and maintain self-images meeting general social expectations on the social "front-stage". After such image-polishing behaviors expand from offline to online real-name social spaces, social burnout becomes a shared experience for most people. A growing number of Generation Z members voluntarily "disembed" themselves from complicated real-world social relationships and turn to virtual social scenarios with lower pressure and higher controllability.

Third, people spend increasing amounts of time on virtual socializing. As digital natives, Generation Z integrate social life deeply into digital spaces. This group does not deliberately

draw boundaries between online friends and real-world acquaintances; they value online communities and remain persistently online rather than logging on temporarily.

2.2. Theoretical Foundations — Intersection of Three Perspectives

Compensation Theory. The core viewpoint of Alfred Adler's Compensation Theory holds that when individuals generate feelings of inferiority, they will form compensatory behavioral strategies to overcome their own defects. Virtual social compensation is a type of social compensation. When individuals perceive incompetence in real-world socializing, such as social anxiety, or suffer from relationship scarcity and loneliness, virtual spaces become "competence fields" with compensatory functions. In real-world social scenarios, Generation Z youth frequently encounter social dilemmas. Offline interpersonal interactions require abiding by complex social etiquette, mastering communication skills, and bearing psychological pressure brought by social missteps and interpersonal conflicts. Some young people cannot build stable and comfortable real-world relationships due to introverted personalities, insufficient social experience and narrow life circles. Stuck in long-term social absence and emotional deficiency, they develop intense inferiority and loneliness. Virtual social scenarios break the shackles of time-space, identity and personality and lower the thresholds and pressures of offline socializing. Generation Z young people can freely express themselves, make friends and integrate into interest communities on online platforms without confronting real-world social embarrassment. This low-cost and highly-adaptable social pattern can effectively make up for shortcomings in their real-world socializing, dispel inferiority and loneliness, and accomplish psychological self-compensation. Such social compensatory behaviors are not passive escapism from reality. Instead, they constitute an important way for young people to adapt to their psychological needs, regulate emotional states and obtain emotional support, and serve as core psychological motivations for contemporary youth's enthusiasm for virtual socializing. In this process, virtual spaces become safe experimental fields where they rebuild self-confidence and explore themselves. Through anonymous interactions and precise community connections, young people can practice social skills in low-risk environments and accumulate positive feedback step-by-step. This psychological compensation mechanism not only relieves immediate anxiety but also provides them with an emotional buffer zone, enabling them to examine real-world relationships with more peaceful minds. Therefore, understanding and respecting such social choices rooted in psychological demands help society comprehensively view the living conditions and spiritual world of youth groups instead of simply labelling them as "socially-phobic" or "escapist".

Social Comparison Theory. Festinger proposed that individuals spontaneously generate demands to evaluate their own opinions and abilities. When objective non-social reference standards are unavailable, they evaluate themselves by comparing with others. The algorithm-matching mechanisms and interest circles in virtual spaces happen to serve as highly-efficient technical-support carriers for such comparative behaviors. Social Comparison Theory also clarifies that comparative behaviors mostly occur among highly-similar individuals. Generation Z members can find "peers" more quickly in virtual circles, which exactly conforms to this rule. The construction of individual self-cognition cannot be separated from social comparison as a core approach. People need to compare themselves with others to clarify their own competence levels, values and life states and further complete self-positioning and cognitive iteration. Compared with real-world social circles which are solidified and make it hard to find similar individuals, internet platforms rely on big-data algorithms to divide communities precisely according to users' interests, values and lifestyles. As digital natives, Generation Z can easily meet peers with highly-matched ages, cognitions and preferences in diverse virtual communities. Within homogeneous virtual circles, young people continuously carry out upward, parallel and downward social comparisons: confirming self-cognition and

gaining group belongingness through parallel comparison; generating motivation for self-improvement by benchmarking outstanding individuals via upward comparison; alleviating self-anxiety and enhancing self-identity through downward comparison. Such convenient, high-frequency and precise virtual social comparisons continuously help Generation Z improve self-cognition and become vital driving forces sustaining their participation in virtual-circle socializing.

Parasocial Interaction Theory mainly interprets the formation process of one-way interpersonal-like relationships between audiences and media figures. In the digital age, the scope of application of this theory extends to human-computer-interaction scenarios. Users can also form emotion-connections similar to interpersonal communications when interacting with AI chatbots. Parasocial interaction bears distinct special attributes: it can reach emotional intensities comparable to genuine interpersonal communications, while users do not need to bear responsibilities and risks of two-way interactions. Such attributes precisely meet Generation Z's practical demands for "low-burden emotional connections" when suffering from social burnout[2]. Traditional Parasocial Interaction Theory focuses on one-way emotional bonds between audiences and media figures such as celebrities and internet influencers. Distinct from two-way and equal real-world interpersonal communications, it features asymmetry, low constraints and zero pressure. With the iterative upgrading of artificial-intelligence technologies, new-media carriers such as AI agents and chatbots emerge, breaking the interpersonal boundaries of traditional parasocial interaction and making human-machine one-way emotional interaction a brand-new social form. Nowadays, under high-pressure study, work and living circumstances, frequent real-world socializing and complicated human-relations easily trigger social exhaustion and emotional internal friction for Generation Z, who gradually resist genuine social relationships requiring two-way dedication and responsibility. In parasocial interactions with AI, users hold absolute social initiative: they can start or terminate interactions at any time, without worrying about emotional feedback, relationship maintenance or social conflicts. Meanwhile, they can obtain high-quality emotional experiences such as companionship, catharsis and emotional comfort. This zero-burden and highly-adaptable emotional connection precisely fits the lightweight and relaxed new-type social demands of Generation Z.

3. Antecedents of Virtual Social Compensation: Why Seek "Cyber-Hugs"?

3.1. Frustrated Real-World Social Demands: The "Push Force" of Compensation

Transfer of social anxiety to online scenarios. Groups with social anxiety constantly worry about receiving negative evaluations from others during real-world socializing and will actively reduce their frequency of participating in social activities. A systematic review conducted by O'Day and Heimberg shows that social anxiety correlates significantly with problematic social-media use. The higher individuals' anxiety levels are, the more inclined they are to seek compensation in online socializing. Nevertheless, such anxiety will not disappear simply because social scenarios shift; instead, it follows individuals into virtual-social spaces, manifested as lower willingness for self-disclosure, more passive online-social behaviors, and ultimately fewer social benefits obtained.

Compensatory-satisfaction phenomena after belongingness deprivation. When individuals fail to acquire sufficient belongingness in real-world socializing, they tend to turn to virtual spaces for corresponding emotional supplies. Such compensatory behaviors are most prominent among groups who feel that they "cannot fit into circles" in real-world socializing. They can find "fellow enthusiasts" in thematically-defined virtual-interest circles and make up for identity recognition unobtained from real-world socializing. Intimate appellations such as "mommy" and "auntie" commonly used in virtual communities construct quasi-kinship relations named

"cyber kinship". This special connection pattern provides alternative emotional belongingness for individuals within an atomized society.

"Disembedding" appeals generated by real-world social burnout. Goffman's relevant studies point out that individuals need to maintain a "front-stage performance" state all the time in daily-social activities. After such performance scenarios expand from offline to online real-name-social scenarios, social burnout becomes a shared feeling for many people. Virtual spaces feature anonymity and low social pressure, allowing individuals to step out of the "front-stage" and enter the "back-stage" for temporary adjustment. Existing research results indicate that when individuals endure real-world-social pressure, they usually actively look for external attachment objects to ease their unease. Virtual-companionship services just offer convenient and low-risk paths for emotional support.

3.2. Unique Inducements of Virtual Environments: The "Pull Force" of Compensation

Anonymity corresponds to lower social risks. The inherent anonymous features of virtual spaces reduce trial-and-error costs for people participating in socializing. In fully-anonymous or semi-anonymous virtual scenarios, users do not fear leakage of real identities or long-term negative consequences caused by social missteps, so they are more willing to reveal their genuine inner thoughts. When consumers use paid virtual-companionship services, they can confide inner secrets without disclosing real identities. The sense of security brought by anonymity constitutes vital support for the continuous development of such compensatory behaviors.

Instant feedback and "perpetual presence". Compared with real-world socializing, various virtual-social platforms deliver much faster message feedback. AI chatbots can even achieve "perpetual presence", namely staying online 24 hours and responding instantly to messages without exhaustion. Such instant-response characteristics satisfy core social demands of individuals for "being seen" and "being responded to", while eliminating waiting-costs in real-world socializing and uncertainties about reply-timing. One interviewee put it plainly: "I just love it when the other party can reply to my messages instantly and take pains to cheer me up. It is hard for people in reality to do so"[3].

Psychological effects of spatial design. Spatial design under virtual scenarios interferes with normal regulation of self-awareness and produces abnormal manifestations. Fu et al. conducted research on the "mirror effect" on the VRChat platform and found that large numbers of users gather around virtual mirrors and adjust behaviors against their virtual avatars. Within psychological categories, such mechanisms give rise to Objective Self-Awareness. Appropriately-controlled exposure durations to virtual mirrors can help socially-anxious groups revise negative self-perceptions. Excessive reliance on virtual-mirrors, however, will enhance levels of self-objectification and make individuals judge themselves from a third-person perspective in real-world-social scenarios, aggravating performance anxiety.

Classified research by Han et al. further clarifies that effects of compensatory behaviors are affected by occurrence scenarios. Compensatory behaviors in "Cuddle Worlds" (small-scale, warm-toned spaces furnished with soft furniture) tend to transform into deep-emotional dependence; compensatory behaviors in "Mingle Worlds" (open, fluid spaces with explicit social scripts) are more likely to convert into practical social-skill practice[4].

3.3. Individual Differences: Who Are More Prone to Activate Compensation Mechanisms

Moderating effects of field-dependent-field-independent cognitive styles. Experiments carried out by Jiang et al. have identified core individual differences in compensation-activatability. Field-dependent users (who tend to rely on external-environmental cues) are more easily

touched by affiliative interactions in virtual-social scenarios, perceive improved social support, and obtain better short-term emotional-relief effects from compensation. Such users are more prone to develop "intimacy-based" dependence on virtual companionship, which will aggravate real-world-social avoidance. Field-independent users (who tend to rely on internal references) are less sensitive to anthropomorphic feedback in virtual-social contexts. Virtual compensation hardly changes their real-world-social motivations through "emotional reinforcement".

Such individuals possess introversion and high-sensitivity. People with these two traits are more susceptible to consumption and exhaustion in real-world-socializing and will actively turn to virtual-socializing for low-energy-consumption emotional connections. Such groups prefer out-of-camera and low-interaction "virtual-scenario-presentation study rooms" and acquire a sense of companionship via "imagining others are present".

Influences of low self-esteem and attachment anxiety. Individuals with low self-esteem are vulnerable to interference from negative evaluations in offline-socializing and therefore tend to seek affirmation and recognition in virtual spaces. People with attachment-anxious traits long for intimate relationships yet fear rejection. The high controllability and low risks of virtual-socializing just provide buffer spaces for alleviating such contradictions.

4. Psychological Mechanisms of Virtual Social Compensation: Three Differentiated Paths

For studies on compensation differentiation, the "Spectrum of Dynamic Needs (SSB)" framework proposed by Zhao and Hasegawa (2026) delivers relatively strong explanatory power. The core viewpoint of this framework is that users' demands when participating in virtual-socializing do not feature a single fixed "Bridge" mode; instead, they dynamically shift among three states: Sanctuary, Sandbox and Bridge. The three states respectively correspond to three differentiated paths of compensation.

4.1. Path A: Substitutive Satisfaction — Short-Term Emotional Buffering as a "Sanctuary"

Virtual-social compensation under the "Sanctuary" mode presents attributes of passive emotional retreat, aiming to restore depleted psychological energy. Such compensation provides substitutive satisfaction: when real-world-social interactions fail to supply sufficient emotional support, virtual interactions can instantly relieve loneliness and raise temporary self-esteem.

Experience-sampling research conducted by Kross et al. shows that users' immediate moods improve after using Facebook, yet such improvement lasts only a short time. Similarly, users obtain emotional comfort within short periods when interacting with AI chatbots. The AI's response pattern of "always positive" and "non-judgmental" exactly meets demands for unconditional support when users are in emotional troughs. The sense of companionship brought by "cloud deskmates" in virtual study rooms and the warm experience of "being seen" in comment sections for electronic-parents all serve as typical manifestations of substitutive satisfaction[5].

The core feature of compensation under the "Sanctuary" mode lies in its "substitutiveness": it satisfies emotional compensation for real-world-socializing rather than reconstructing real-world-socializing itself. Emotional gratification individuals obtain from virtual interactions is often instant and situational and can hardly transform into lasting psychological resources. When individuals are in the "Sanctuary" mode, their primary appeal for virtual spaces shifts from "connection" to "absolute disconnection". Longitudinal tracking indicates that after experiencing real-world setbacks, users explicitly demand "do not recommend people

I may know". The essence of compensation at this moment is emotional retreat, designed to grant exhausted minds breathing space[6].

4.2. Path B: Vicious Circle — Long-Term Deterioration When the "Bridge" Fails

Virtual-social compensation may initiate a vicious circle if it cannot transition from "Sanctuary" to "Bridge" or if the "Bridge" function fails. This circle consists of three mutually-reinforcing links.

The trap of upward social comparison. Many people publish polished "perfect-life" content on social-media platforms. Individuals with social-anxiety gain access to massive such materials available for upward comparison. According to Festinger's research conclusions, individuals tend to develop negative emotions and lower self-evaluations after comparing themselves with others in better conditions. In the compensation context, individuals already possess relatively low self-esteem. Repeated upward comparisons further weaken self-esteem and deepen avoidance of real-world-socializing. Existing research data show that passive social-media-use behaviors (such as merely browsing others' content) correlate far more strongly with negative emotions than active-use behaviors.

Here we discuss the degradation phenomenon of real-world-social skills. Uses-and-Gratifications Theory holds that individuals' original intentions for media use directly influence subsequent usage patterns and final practical effects. If individuals treat virtual-socializing not as a supplement to real-world-socializing but as a direct replacement for real-world-social exchanges, real-world-social skills will gradually decline due to lack of practice opportunities. Research by Xu Lulu shows that college students who rely heavily on virtual-companionship experience greater discomfort in real-world-social scenarios. One interviewee mentioned: "I feel quite upset all of a sudden when some people say my viewpoints are wrong. I might not have felt so upset before."

The paradox of "more compensation brings greater loneliness". The core paradox of compensatory behaviors is: the more individuals rely on virtual-socializing to relieve loneliness, the more degraded their real-world-social competence becomes, the harder real-world-socializing finds it to satisfy their emotional demands, and the greater their need for virtual-social-compensation becomes — a self-reinforcing vicious circle thus forms. Further research by Han Xiu et al. indicates that the higher the degree of users' parasocial interaction with social robots, the stronger their experience of social loneliness. The "masking effect" of media-dependence appears here: virtual-companionship seemingly relieves loneliness, yet it aggravates loneliness at deeper levels by occupying time and energy for real-world-socializing. Such vicious circles are particularly obvious when the "Bridge" mode fails. The "Bridge" ought to be a transitional channel for transferring virtual skills to reality. Without structural support such as "social-difficulty grading", however, the "Bridge" turns into an invalid space filled with "exclusive small circles" and "chaotic atmospheres". Users cannot accomplish a "soft landing" from virtuality to reality and eventually either retreat to the "Sanctuary" or suffer repeated setbacks within the "Bridge".

4.3. Path C: Empowerment Spillover — Positive Transformation as a "Sandbox"

Although vicious circles constitute the most worrying direction of virtual-social-compensation, compensation may also generate positive "empowerment-spillover" effects — when virtual spaces operate as a "Sandbox", their function lies in active reconstruction of self-efficacy.

Freeman and Acena's research on social-VR finds that some users gradually enhance real-world-social confidence and communication competence by building social-relationships in virtual spaces. The core of the "Sandbox" mode is to provide a low-risk social-practice field. Interviewees in literature treat AI or virtual avatars as opponents for "unlimited trial-and-error": "Interactions in real-life bear costs... With AI, I obtain something for unlimited

trial-and-error." Social skills acquired in virtual environments — such as initiating conversations actively, expressing emotional demands and handling social conflicts — can be transferred to real-world-social scenarios[7].

To complete relevant positive transformations, practice rather than substitution is essential. If individuals treat virtual-socializing not as a "refuge" from real-world-socializing but as a "practice-field", original compensatory behaviors will break away from escapist attributes and turn into growth-promoting mechanisms. Research by Jiang Tingting et al. shows that when virtual peers adopt an affiliative-humorous style, users' perceived social support and sense of intimacy improve significantly, alongside enhanced confidence in real-world-socializing. Such positive-spillover effects of virtual-socializing will not emerge automatically; they must be triggered by specific interactive designs, and appropriate humorous styles serve as typical examples of such designs.

Combined with settings of the SSB framework, spillover effects occur only when users can transition smoothly from the "Sandbox" to the "Bridge" phase. For the "Bridge" to achieve expected outcomes, corresponding access conditions must be set, and platforms need to launch "social-difficulty-grading" mechanisms so that users will voluntarily transfer skills acquired in virtual scenarios to reality. After virtual-socializing is no longer limited to its original attribute of "emotional consumption" and undertakes functions of "skill-practice", "cyber-hugs" may jump out of positioning as mere emotional "painkillers" and become "catalysts" driving personal growth.

5. Boundary Conditions and Moderating Factors: When Is It a "Painkiller" and When Is It a "Poison"?

5.1. Internal Individual Factors: Level of Self-Differentiation and Baseline of Real-World-Social Competence

Level of self-differentiation. Self-differentiation refers to individuals' capacity to preserve independent personalities while maintaining stable emotional bonds with others. Groups with high self-differentiation levels will not reduce participation in or positive expectations for real-world-socializing when satisfying emotional demands through virtual-socializing. Groups with low self-differentiation levels are more prone to cognitive biases that "absolutize" virtual-relationships. They take idealized experiences obtained from virtual-socializing as reference standards for real-world-socializing, deepening their dissatisfaction with and resistance toward real-world-socializing. Existing research results show that even if socially-anxious groups obtain virtual-social support via compensatory channels, such support can hardly promote improvement of their real-world-social competence.

Baseline of real-world-social competence. For individuals with inherently strong real-world-social competence, virtual-social-compensation acts more as supplementation rather than substitution. Such individuals can flexibly switch between virtual and real-world-social scenarios and treat positive-experiences from virtual-socializing as energy supplements for real-world-socializing. For individuals with inherent deficiencies in real-world-social competence, virtual-social-compensation makes it easier for them to fall into vicious circles.

5.2. Compensation Content: Differentiated Effects of Deep-Level Socializing versus Shallow-Level Socializing

The direction of compensation development hinges crucially on the depth of compensation content. Long-term dialogues with AI lovers and deep-emotional exchanges in virtual communities all belong to deep-level socializing. Such socializing can satisfy individual demands for intimate-relationships to a certain extent, yet it also makes users more susceptible

to emotional-dependence and generates contrast gaps compared with real-world-socializing. Behaviors such as browsing comments, clicking likes and forwarding lucky-charms belong to shallow-level socializing. Such socializing mostly delivers instant emotional stimuli and cannot bring users lasting emotional-gratification.

Existing research results show that compensation content of different depths corresponds to distinct psychological consequences. When consumers use virtual-companionship services, their interactions with companions initially meet functional demands. As accumulated "emotional energy" builds up during interactions, virtual-intimate-relationships between both parties may break away from instrumental attributes and gradually shift to emotional-dependence. The deepening degree of such emotional-dependence determines the ultimate direction of compensation: whether it stays at the "Sanctuary" level or migrates toward the "Sandbox" or "Bridge".

5.3. Real-World Ecology: Buffering Effects of Family-Support and Offline-Peer-Relationships

Buffering effects of family-support. As the core social-support resource accessible to individuals, family-support can relieve negative emotions generated after individuals suffer real-world-social setbacks. Existing research results show that the higher the level of family-support individuals perceive, the weaker their willingness to choose virtual-compensation after social-setbacks. If individuals experience tense family-relations or are in a "family-disconnection" state, they tend to seek emotional-compensation from "electronic-parents" in virtual spaces.

Moderating effects of offline-peer-relationship quality. High-quality offline-peer-relationships can supply embodied emotional-experiences irreplaceable by virtual-socializing — touches, hugs and face-to-face emotional resonance. Xu Lulu finds that college students with stable real-world-social networks tend to treat virtual study rooms as "supplements" rather than "substitutes": "I will not abandon reality because of this. When real-problems arise, I still choose to communicate with friends around me." This means that when individuals possess stable and deep offline-social-networks, virtual-social-compensation basically functions only as supplementation and will not fall into replacing offline-socializing.

6. Conclusions and Prospects

6.1. Research Conclusions

This paper focuses on psychological mechanisms of virtual-social-compensation among Generation Z college students, and core findings are as follows:

First, the occurrence of virtual-social-compensation originates from interactions among frustrated real-world-social demands (push force), unique inducements of virtual-environments (pull force) and individual-cognitive-style differences. Among them, individuals with field-dependent cognitive-styles are more likely to activate compensation mechanisms and more susceptible to emotional-dependence on virtual-socializing.

Second, differentiation of compensation-effects corresponds mainly to three developmental paths: substitutive-satisfaction performing "Sanctuary" functions delivers short-term emotional-buffering; vicious-circles caused by failed "Bridges" are jointly generated by upward-social-comparison and degradation of practical-skills, forming the paradox of "more compensation brings greater loneliness"; capability-spillover exerting "Sandbox" functions should be analyzed under the Spectrum-of-Dynamic-Needs framework, and positive transfer can be realized only upon smooth transition from "Sandbox" to "Bridge".

Third, the ultimate developmental boundary of compensation results from interactions among self-differentiation-level, depth of compensation-content and real-world-ecological-support.

The higher individuals' self-differentiation-level, the more compensation-content leans toward deep-level socializing, and the more sufficient real-world-ecological-support becomes, the easier it is for compensation to transform in positive directions.

6.2. Research Limitations and Future Directions

This research has three limitations. First, it is dominated by cross-sectional analysis, making it difficult to confirm causal directions and long-term effects of compensatory behaviors. Second, localization verification of Western theories still needs deepening — frameworks such as SSB and Parasocial Interaction Theory are mainly based on Western-cultural contexts, and their applicability among Chinese Generation Z college-students needs further testing. Third, it focuses mostly on psychological dimensions of compensation and pays insufficient attention to neuro-cognitive mechanisms.

Subsequent research on this topic can continue deepening in three directions: first, conducting long-term longitudinal tracking of compensatory behaviors to sort out dynamic-evolution rules of such behaviors and clarify their long-term-psychological-influences; second, promoting development of localized "Virtual-Social-Compensation Scale" to prepare measuring-tools with adequate reliability and validity for subsequent quantitative-research; finally, exploring feasible intervention targets, such as strengthening real-world-bonds, raising self-differentiation-levels and optimizing the "depth" of compensation-content, so as to guide compensation to shift toward positive transformations.

6.3. Practical Implications

For college-student mental-health education, the key to coping with virtual-social-compensation phenomena lies not in simple "prohibition" or "desensitization", but in guiding the "upgrading" of compensation-content: from passive emotional-consumption to active social-skill-practice, from shallow sensory-stimulation to deep-emotional-connection, and from "Sanctuary"-style escapism to "Sandbox-Bridge"-style growth. When virtual-socializing changes from a "refuge" to a "practice-field", and from a "substitute" to a "supplement", "cyber-hugs" are likely to evolve from "painkillers" into "growth-catalysts" — and this constitutes precisely the new direction that mental-health education in the digital-era needs to explore.

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