Health Risk Behaviors in Children and Adolescents During the COVID-19 Pandemic: A Family Risk Perspective

Authors: Zhou Jiawen, Wang Mingyi, Wang Mingyi

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Abstract

During the COVID-19 pandemic, health risk behaviors among children and adolescents surged dramatically, yet their effects continue to persist as daily life gradually returns to normal. These behavioral changes were primarily characterized by excessive screen time, drastic reductions in physical activity, increased sedentary behavior, monotonous dietary patterns, irregular eating habits, and delayed sleep-wake schedules. The present study constructs a family risk framework for health risk behaviors among children and adolescents within the pandemic context to elucidate the underlying mechanisms driving these behavioral changes. This framework, integrated with life history theory, provides explanatory power for the persistence of health risk behaviors among children and adolescents in the post-pandemic era. Future research should longitudinally track the developmental trajectories of health risk behaviors in this population and enhance empirical research on the interplay among family risk factors, life history theory, and health risk behaviors, thus offering generalizable approaches to addressing health concerns in children and adolescents during similar major emergencies and natural disasters.

Full Text

Preamble

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ZHOU Jiawen, WANG Mingyi (Department of Psychology, School of Humanities and Social Sciences, Beijing Forestry University, Beijing 100083, China)

Abstract

The COVID-19 pandemic led to a significant surge in health risk behaviors among children and adolescents, with effects that have persisted even as daily life has gradually normalized. These behavioral changes primarily manifested as excessive screen time, sharp declines in physical activity, increased sedentary behavior, monotonous and irregular eating patterns, and later bedtimes with correspondingly later wake times. This paper constructs a family risk framework to explain the underlying mechanisms driving these changes in health risk behaviors during the pandemic. By integrating this framework with life history theory, we provide an explanatory model for the persistence of these behaviors in the post-pandemic era. Future research should conduct long-term tracking of developmental trajectories in children and adolescents' health risk behaviors and strengthen empirical investigations into the relationships among family risk factors, life history theory, and health risk behaviors. Such efforts will yield universal strategies for addressing youth health issues during major public health emergencies and natural disasters.

Keywords: COVID-19, health risk behaviors, children and adolescents, family risk, life history theory

Health risk behaviors refer to all actions that directly or indirectly impair the health, well-being, and lifelong quality of life of children and adolescents (Ji, 2007). The 2019 COVID-19 outbreak prompted strict control measures worldwide to minimize viral transmission. Regional stay-at-home restrictions created multiple developmental risks for youth, with health risk behaviors becoming increasingly prominent (Woods et al., 2020). López-Bueno et al. (2021) emphasized the need to focus on potential changes in screen use, sedentary behavior, physical activity, sleep, and diet among children and adolescents during the pandemic. Current research has primarily analyzed individual health risk behaviors in isolation (Carroll et al., 2020; Ten Velde et al., 2021). Therefore, a systematic review and synthesis of multiple health risk behaviors is necessary to comprehensively understand the pandemic' s potential impacts on youth health behaviors.

During the pandemic, children and adolescents faced partial or complete restrictions on activities outside the home, making family upbringing particularly crucial. Previous studies have shown that child maltreatment rates increased during emergencies such as natural disasters and epidemics (H1N1) (Douglas et al., 2009; Seddighi et al., 2021), while parenting functions became compromised (Brooks-Gunn et al., 2013). Prime et al. (2020) argued that COVID-19 created multifaceted family risks that would further affect youth adaptation. The pandemic repeated patterns seen in previous large-scale adverse events but was more extensive, profound, and enduring. The family became children' s primary source of support during the pandemic, highlighting the unique role of family factors in child development. However, no existing research has analyzed the causes of pandemic-related health risk behaviors in youth from a family risk

perspective.

Life history theory posits that harsh and unpredictable early-life environments predispose individuals toward fast life history strategies, characterized by a willingness to sacrifice future benefits for immediate gratification (Guan & Zhou, 2016; Ellis et al., 2009), which manifests as more health risk behaviors (Lin et al., 2023; Luo et al., 2020; Zhang et al., 2023). Some researchers view the pandemic as a "natural experiment," where variable social and family environments provide conditions for studying early-life contexts (Liu & Fisher, 2022). Studies have shown that pandemic-related stressors positively predicted fast life history strategy tendencies among Chinese middle school students (Yang, Z. et al., 2022). As the pandemic situation evolved and daily routines gradually resumed, some youth health risk behaviors have not returned to pre-pandemic levels (Wu et al., 2022). Could this persistence be related to fast life history strategy tendencies formed during exposure to variable pandemic environments?

In summary, questions about how, why, and to what extent health risk behaviors among children and adolescents have changed, emerged, and persisted during the pandemic warrant in-depth investigation. This paper first systematically summarizes the changing characteristics of multiple prominent health risk behaviors among youth during COVID-19. Second, it proposes a family risk framework for pandemic-related health risk behaviors, analyzing their causes from a family risk perspective. Finally, it attempts to integrate this framework with life history theory to explain the persistent effects of these behaviors in the post-pandemic era from a dynamic developmental perspective. This work provides a systematic observational and theoretical lens for research on youth health behavior development, helps understand the drivers of behavioral changes during extraordinary times, offers scientific evidence for targeted family interventions, and provides universal solutions for handling youth health issues in future emergencies.

2.1 Literature Search and Screening

To systematically review research on health risk behaviors among children and adolescents during the pandemic, we conducted a comprehensive literature search and screening process. We limited our search to Chinese and English articles published between January 2020 and December 2023. For Chinese databases (CNKI, Wanfang, and VIP), we used search terms including "children," "adolescents," "COVID-19," "health risk behaviors," "health behaviors," "screen exposure" (or "screen use"), "sleep," "physical activity," "sedentary behavior," and "eating habits." For English databases (Web of Science and ProQuest), we used "Covid-19," "SARS-CoV-2," "children," "adolescent," "health risk behaviors," "screen time," "sleep," "physical activity," "sedentary behaviors," and "eating." The initial search yielded 37 Chinese articles (all from CNKI) and 13,802 English articles (9,319 from Web of Science; 4,483 from ProQuest).

After removing duplicates across databases, we excluded literature outside psy-

chology, sociology, biology, and medicine domains, as this study focuses on infectious diseases and health behaviors. This step eliminated 13,613 English articles, leaving 226 articles (37 Chinese, 189 English). We then manually screened titles, abstracts, keywords, and full texts, excluding studies unrelated to our topic and those involving participants with pre-existing health conditions or medical histories. The final sample comprised 117 valid articles: 30 Chinese and 87 English. Specifically, we retained 35 articles on screen time, 32 on physical activity and sedentary behavior, 33 on diet, and 17 on sleep. Due to convergence in findings within each behavior category, we will discuss only representative studies with typical results.

2.2 Screen Time

Excessive screen time emerged as a global issue among children and adolescents during the pandemic, with multiple countries reporting significant increases (Ten Velde et al., 2021; Xiao et al., 2021). A meta-analysis by Trott et al. (2022) revealed that children aged 6–10 experienced the largest increase in total screen time (approximately 1.39 hours per day), followed by adolescents aged 11–17 (0.91 hours per day) and children aged 0–5 (0.59 hours per day), suggesting that elementary school children may have been most affected.

Regarding screen time allocation, children aged 3–7 primarily increased screen use for entertainment rather than learning (Pfefferbaum & Van Horn, 2022). For school-aged children and adolescents, even during online learning, increased total screen time was associated with entertainment use (McArthur et al., 2021). During the pandemic, 57.5% of children exceeded the recommended two-hour daily limit for recreational screen time (Breidokienė et al., 2021), with short videos, movies, television shows, and gaming being the main recreational activities (Susilowati et al., 2021).

2.3 Physical Activity

Pandemic control measures drastically reduced opportunities and venues for physical activity among children and adolescents, leading to insufficient exercise and increased sedentary behavior (Breidokienė et al., 2021; Pietrobelli et al., 2020). A meta-analysis by Nevill et al. (2022) found that youth physical activity decreased by an average of 20% during the pandemic, with moderate-to-vigorous activity showing the largest decline. A longitudinal study in China showed that average physical activity time among youth dropped sharply from 540 minutes per week pre-pandemic to 105 minutes per week during the pandemic, with the proportion of insufficient physical activity increasing by 44.3% and average weekly sedentary time rising by approximately 30 hours (Xiang et al., 2020). Moreover, older children engaged in less physical activity (Du et al., 2021) and had longer sedentary time (Knight et al., 2022; Siegle et al., 2020).

2.4 Daily Diet

The pandemic also altered dietary patterns among children and adolescents in multiple ways. First, food variety decreased, with reduced consumption frequency of fresh vegetables, fruits, soy products, and dairy products (Liu et al., 2020; Sidor & Rzymski, 2020), while snack intake increased, particularly fried foods and sweets (Carroll et al., 2020; Clarke et al., 2021).

Second, the pandemic affected eating behaviors, causing appetite changes, irregular eating patterns, and increased emotional binge eating (Philippe et al., 2021; Sylvetsky et al., 2022). Notable manifestations included decreased appetite or reduced satiety (Umano et al., 2022), increased snacking between meals (Jansen et al., 2021), and skipping breakfast (Sugimoto et al., 2023). These behavioral issues tended to worsen with age (Pujia et al., 2021).

2.5 Sleep

The pandemic significantly altered sleep patterns among children and adolescents (Genta et al., 2021; Zhou et al., 2020), including later bedtimes and wake times, increased sleep duration, decreased sleep quality, and significantly higher rates of sleep problems.

During the pandemic, youth generally exhibited later sleep-wake patterns (Liao, 2021), with bedtime delayed by an average of 0.78 hours (Richter et al., 2023) and wake time delayed by 1.27 hours (Lim et al., 2021). Although this "later to bed, later to rise" pattern somewhat increased total sleep duration, researchers suggest that such sleep extension during major disruptions does not improve sleep quality (Bates et al., 2020; Wang et al., 2022). Meanwhile, the detection rate of sleep problems among Chinese children aged 2–12 reached 76.07% during the pandemic, significantly higher than the pre-pandemic rate of 50.64% (Liao, 2021), and the proportion of adolescents over 15 experiencing sleep disorders increased markedly compared to pre-pandemic levels (Zhai et al., 2021).

In summary, children and adolescents experienced a series of changes in health risk behaviors during the pandemic, notably excessive screen time, reduced physical activity, increased sedentary behavior, monotonous and irregular eating, and later sleep schedules. Given these patterns, examining the underlying psychological mechanisms is crucial. The following sections analyze the family-based causes of these behavioral changes to provide scientific evidence for interventions.

3 Family Risk and Youth Health Risk Behaviors During COVID-19

During the pandemic, youth psychological and behavioral outcomes were closely linked to family factors. Prime et al. (2020) proposed a conceptual framework of family risk and resilience during COVID-19, suggesting that the pandemic pri-

marily affected child adaptation by altering family environments and caregiver psychological states, which then permeated parent-child interactions.

While this theory provides valuable insights for understanding increased health risk behaviors during the pandemic, it remains relatively macro-level, lacks specific focus on health risk behaviors, and has limited pandemic-era data support with unclear factor characteristics. Based on existing research, we extend Prime et al.' s theory by proposing a family risk framework for youth health risk behaviors during the pandemic (see Figure 1 [Figure 1: see original paper]). This framework offers more detailed categorization of family factors and analyzes hierarchical relationships to comprehensively explain how family factors relate to youth health risk behaviors during COVID-19.

The framework posits that changes in youth health risk behaviors during the pandemic stemmed from risks permeating the proximal parenting environment. Within this environment, parenting processes characterized by "lax rule-setting," "harsh discipline," inefficient parent-child communication, and intensified parent-child conflict were key triggers. Increased caregiver stress and deteriorating emotional health served as mediating links, while deteriorating family economic conditions, food security issues, and changes in work/learning styles formed the foundational layer. Beyond examining unique changes in the proximal parenting environment, we must recognize that pre-existing family vulnerability may act as an "amplifier," exacerbating the negative effects of pandemic-related family risks on youth health risk behaviors.

3.1.1 Negative Parenting Behaviors

During the pandemic, parenting processes—the critical link directly affecting youth health risk behaviors—first showed increases in negative parenting behaviors. Research indicates that parents provided less support and positive parenting while increasing negative behaviors (Donker et al., 2021). Our analysis identifies two distinct yet interconnected negative parenting patterns during the pandemic: lax rule-setting and harsh discipline, both closely linked to youth health risk behaviors.

Lax rule-setting manifested as insufficient rules and supervision. Studies show caregivers adopted more permissive approaches, reducing restrictions during the pandemic (Hails et al., 2022; Philippe et al., 2021). Regarding internet use, caregivers inadequately supervised children' s online activities, relaxed time limits, and neglected content monitoring, leading to excessive device use (Lau & Lee, 2021) and consequently reduced physical activity and increased sedentary time. For sleep, caregivers relaxed bedtime management, allowing later wake times without limiting sleep duration, disrupting circadian rhythms (Richter et al., 2023). For diet, caregivers became more lenient about food choices and stopped enforcing regular meal times, making children more prone to irregular eating and consumption of non-nutritious foods, particularly sweet and salty snacks (Loth et al., 2022). This permissiveness created nutritional imbalances

and unhealthy eating habits, increasing obesity and health risks. Although some caregivers adopted lax approaches believing "children should be happier during such difficult times" (Jansen et al., 2021), balancing autonomy and structure remains essential, with conscious efforts needed post-pandemic to help children reestablish rules and routines.

Harsh discipline involved excessive punishment and inappropriate punitive measures. During the pandemic, caregivers showed lower tolerance for noncompliance (Sari et al., 2022) and engaged in harsh disciplinary acts. Research shows parents were 77% more likely to yell at children and 124% more likely to hit them compared to pre-pandemic times (Lee et al., 2022). A meta-analysis of multinational data revealed wide variation in maltreatment rates during the pandemic: physical abuse (0.1%–71.2%), psychological abuse (4.9%–61.8%), neglect (7.3%–40%), and sexual abuse (1.4%–19.5%) (Huang et al., 2023). A survey in rural Hubei, China found child psychological abuse rates far exceeded pre-pandemic levels (Zhang et al., 2022). Such harsh discipline and abuse create disharmonious family atmospheres, harm children' s physical health (Brody et al., 2014), and trigger more health risk behaviors (Jackson & Choi, 2018). Thus, providing positive interaction, support, and appropriate supervision is critical during crises.

These two parenting approaches are not contradictory but represent different strategies used at various pandemic stages. Early on, limited caregiver energy and desires to grant autonomy led to lax rule-setting. However, this permissiveness gradually increased health risk behaviors, prompting caregivers to implement harsher discipline to restore order. Notably, excessive harshness may further worsen youth health risk behaviors, requiring careful, moderate implementation.

3.1.2 Tense Parent-Child Relationships

Parent-child relationships—defined as the interpersonal dynamics formed through interactions between parents and children, encompassing care, emotion, and communication (Wang & Feng, 2006)—also showed increased tension during the pandemic. Inefficient communication and intensified conflict represent core manifestations of this tension.

The pandemic demanded greater patience and understanding, yet caregivers often struggled to choose appropriate topics and methods, resulting in inefficient communication. With overwhelming and sometimes false pandemic information, a domestic study found that children who asked parents more pandemic-related questions showed more screen time, less sleep, and poorer sleep quality, especially when parents expressed negative emotions or discussed the pandemic in children' s presence (Du et al., 2021). Additionally, home confinement increased educational burdens and parental anxiety, with communication often focusing on academics rather than children's psychological or behavioral needs, hindering healthy development (Chen, 2022). Frequent discussions about the pandemic

and academics may increase youth anxiety, leading them to adopt health risk behaviors to cope. Caregivers should therefore attend to topic selection and communication methods, using diverse activities post-pandemic to provide guidance and support while reducing health risk behavior tendencies.

Parent-child conflict is a known risk factor for youth health risk behaviors (Fosco, LoBraico, et al., 2022). Prolonged pandemic life challenged children' s limited self-regulation capacities, intensifying parent-child conflict (Hua, 2023), with boys experiencing higher conflict levels than girls and middle school students reporting significant increases (Liu et al., 2021). Escalated conflict triggers maladaptive outcomes, generating negative emotions (Hua, 2023) that may cause poor sleep and unhealthy coping behaviors (Foley et al., 2021). For example, children may increase social media use to gain support and avoid parental contact, creating additional health risks. Research shows parent-child conflict is a key factor affecting post-pandemic youth adjustment: children in high-conflict families faced more psychological distress after school reopening, while this association was non-significant in low-conflict families (Qu et al., 2021). Thus, caregivers must attend to and improve parent-child relationships, reducing conflict to provide emotional support and guidance that fosters positive coping and reduces health risk behaviors (Liu & Doan, 2020).

3.2 Caregivers

As the "hub" connecting environmental changes to parenting processes in the proximal environment, caregivers experienced most notably increased stress levels and deteriorating emotional health during the pandemic.

Compared to childless adults, parents reported significantly higher stress during the pandemic, with approximately 68.6% indicating increased stress levels (Jansen et al., 2021). About half reported moderate to severe emotional impacts (González et al., 2022), and 25% reported clinically significant anxiety and depression (Johnson et al., 2022), with mothers showing lower well-being and higher anxiety (Cusinato et al., 2020). These findings reveal concerning mental health among caregivers, who had limited opportunities for self-care, suggesting that stress and negative emotions may have persisted or worsened without timely adjustment.

Caregiver stress and emotional states directly influenced parenting processes (Chung et al., 2022). Deater-Deckard (1998) found that highly stressed parents were more likely to adopt authoritarian, harsh, or negative parenting behaviors and had poorer parent-child relationships. Liu and Doan (2020) suggested that increased pandemic-related psychological burden may spill over into parenting responsibilities, hindering sensitive and timely care and leading to behavioral deviations or health risk behaviors (Lorenzo-Blanco et al., 2017). Studies show that parental negative emotions (fear, anger, loneliness, sadness) correlated positively with controlling parenting behaviors (Wissemann et al., 2021), and increased caregiver stress was associated with more negative feeding practices

(Pietrobelli et al., 2020), increased harsh parenting, and reduced parent-child closeness (Chung et al., 2022), ultimately manifesting as increased youth health risk behaviors (Oliveira et al., 2022). In summary, caregiver stress and negative emotions may create cascading effects on parenting processes that influence youth health risk behaviors.

3.3 Family Objective Living Conditions

Changes in family objective living conditions during the pandemic formed the foundation of proximal environment changes and primary sources of caregiver stress (González et al., 2022; Yan et al., 2021), most evident in three areas: economic deterioration, food security issues, and shifts in work/learning modalities.

Regarding family economics, approximately 40% of U.S. families and over 25% of Japanese families reported worsening financial situations (Jansen et al., 2021; Yamaoka et al., 2021). In China, about 48% of families experienced partial income loss, with greater losses closer to epidemic centers (Qian & Fan, 2020). Literature on previous disasters and economic crises shows that financial hardship increases parental stress and negative emotions, deteriorates family relationships, and affects youth health behaviors (Bywaters et al., 2016). Additionally, reduced family income may cause resource scarcity, creating psychological stress and life difficulties that increase risks of internet addiction and binge eating (Slack & Yoo, 2005).

Food security was also impacted, with pandemic-related disruptions affecting food supply, access, freshness, and variety. Multiple countries reported increased proportions of families experiencing food insecurity (Pereira & Oliveira, 2020). In Nanjing, China, household food insecurity rose from 21.1% pre-pandemic to 69.3% during the pandemic (Zhong et al., 2022). Food insecurity creates parental stress and concerns that trigger parenting dysfunctions and negative child outcomes (Johnson & Markowitz, 2018). For example, food-insecure families had difficulty accessing fresh foods, purchased more storable high-calorie processed foods, and exerted greater pressure on children to eat (Censi et al., 2022), further affecting eating behaviors such as binge eating and picky eating (Jansen et al., 2017).

Furthermore, family members faced changes in work and learning modalities. With restricted outdoor activities, most youth transitioned to online learning at home while caregivers worked remotely. This shift moved children from structured school environments to more permissive home settings requiring adaptation, while caregivers assumed greater educational responsibilities including supervision, tutoring, and teacher communication (Wang et al., 2023), creating conflicts between work and parenting demands (Dong et al., 2020). This context increased caregiver stress, potentially reducing supervisory capacity and indirectly increasing youth health risk behaviors.

3.4 Pre-existing Family Vulnerability

Family vulnerability refers to a family' s ability to anticipate, cope with, and recover from crises (Wisner et al., 2004). Research has measured vulnerability through unemployment, household crowding, presence of family members needing special medical care, and parental education levels, confirming that higher pre-pandemic vulnerability hindered family functioning during COVID-19 (Chavez et al., 2021). Studies on living conditions found that poorer pre-pandemic economic foundations led to greater pandemic impacts, including difficulties accessing food and mental health assistance, increased family stress, and domestic disharmony (Hall et al., 2022). Inadequate parenting resources threatened healthy child development. At the caregiver level, adverse childhood experiences among parents constituted family vulnerability; caregivers with higher levels of such experiences showed pandemic-related distress predicting negative parenting and more child emotional/behavioral problems (Hails et al., 2022). At the parenting process level, Fosco, Sloan et al. (2022) extended vulnerability to include pre-existing parenting patterns, finding that pre-pandemic harsh parenting better predicted children' s internalizing and externalizing problems during the pandemic compared to permissive parenting.

In summary, increased youth health risk behaviors during the pandemic closely relate to changes in parenting processes, caregivers, objective living conditions, and pre-existing family vulnerability. However, the current framework cannot fully explain why these behaviors persist post-pandemic. Therefore, we next integrate life history theory to expand the framework' s applicability to the post-pandemic era.

4 Predictions Based on Life History Theory

As the pandemic evolved and daily routines resumed, family-level risks have partially alleviated, yet some youth health risk behaviors have not returned to pre-pandemic levels. This persistence cannot be viewed merely as a temporary continuation of unhealthy habits. Liu and Fisher (2022) argue that COVID-19' s impacts are profound and enduring, significantly affecting youth early-life environments. Early-life environment is a key focus of life history theory, which posits that environmental harshness and unpredictability predispose individuals toward fast life history strategies—tendencies to sacrifice future benefits for immediate gratification (Mittal & Griskevicius, 2014). For children and adolescents, COVID-19 occurred during critical developmental periods, and pandemic-related family risks may have constituted environmental harshness and unpredictability that predisposed youth toward fast life history strategies, potentially explaining the persistence of health risk behaviors post-pandemic. Therefore, integrating life history theory can supplement the family risk framework and provide a dynamic developmental perspective on these persistent effects.

Early-life environmental harshness is typically measured by family income and resources (Belsky et al., 2012; Rickard et al., 2010), while unpredictability re-

lates to changes in living and parenting environments, such as unstable caregiver emotions/behaviors and low-quality parent-child relationships (Luo et al., 2020; Maranges et al., 2022). We propose that pandemic-related changes in objective living conditions reflect environmental harshness, while deteriorated caregiver mental states and negative parenting processes reflect unpredictability. Consequently, youth may have developed fast life history strategy tendencies during the pandemic. Research shows pandemic stressors positively predicted fast life history strategies among Chinese middle school students (Yang, Z. et al., 2022). Future orientation and delay discounting are closely related to life history strategies; fast-strategy individuals show lower future orientation (Chen et al., 2016; Lu & Chang, 2019) and higher delay discounting rates (Lu et al., 2022), prioritizing immediate over long-term gains. A longitudinal study found that greater declines in parental support during the pandemic led to more pronounced reductions in adolescents' future orientation (Fakkel et al., 2023). Pandemic-related stress predicted greater delay discounting among children (average age 10.33) but not adolescents (average age 17.06) (Crandall et al., 2022), suggesting childhood may be a critical developmental period linking pandemic environmental harshness/unpredictability to fast life history strategies. Future research should examine how pandemic impacts on life history strategies vary by age and developmental stage.

Fast life history strategies are closely linked to health risk behaviors, including binge eating (Luo et al., 2020), smartphone/internet addiction (Zhang et al., 2022), increased sedentary behavior (Lin et al., 2023), excessive alcohol use (Athamneh et al., 2022), smoking (Lu & Chang, 2019), and substance abuse (Richardson et al., 2014). Post-pandemic, youth smartphone use has not returned to pre-pandemic levels (Fung et al., 2021; Gueron-Sela et al., 2023; Tapia-Serrano et al., 2022), with 1.15% of middle school students using phones over 42 hours weekly (Gao et al., 2023) and 5.28% of adolescents showing internet addiction symptoms absent pre-pandemic (Wu et al., 2022). While physical activity levels have recovered, youth increasingly rely on structured rather than unstructured spontaneous activity (Walker et al., 2023), and sedentary behavior remains 13 minutes per day higher than pre-pandemic (Jago et al., 2023). Compared to pre-pandemic times, 70% of caregivers reported increased children' s leisure screen time, 44% noted reduced physical activity, and 16% observed deteriorated eating habits (Weihrauch-Blüher et al., 2023). These findings suggest that persistent post-pandemic health risk behaviors may reflect fast life history strategy tendencies requiring further empirical investigation.

5.1 Multi-Faceted Exploration of Pre- and Post-Pandemic Health-Related Behaviors

This study focuses on youth health risk behaviors during and after the pandemic, systematically summarizing the most prominent changes in screen time, physical activity, diet, and sleep. However, this summary represents a qualitative analysis of existing literature. Quantitative methods are needed to further examine

differences across age groups, genders, regions, and cultures, as well as relationships among different health risk behaviors and their relative impacts during the pandemic. Notably, as prevention levels have declined, insufficient research supports understanding of subsequent behavioral changes. Since health risk behaviors directly threaten youth health and development, long-term tracking surveys are necessary to obtain richer data for targeted intervention strategies.

Health-related behaviors encompass all individual or group actions related to health or disease (Godin & Kok, 1996). While health risk behaviors showed specific changes during the pandemic, health promotion behaviors—actions that enhance health through lifestyle practices (Martinelli, 1999)—also changed. Pandemic-era health promotion behaviors may have included mask-wearing, social distancing, and regular hand hygiene (Howe et al., 2021). A Chinese survey found over 94.80% of respondents adopted protective measures, including mask-wearing (97.97%), social distancing (94.04%), and hand hygiene (89.84%) (Jia et al., 2022). Given varying pandemic impacts and policies across countries, youth health promotion behaviors and their maintenance post-pandemic may differ internationally. Cross-national comparative studies are needed to comprehensively understand how health behaviors persist and evolve across cultural and social contexts, informing more precise, culturally adapted health interventions.

5.2 Strengthening Longitudinal Research on the Family Risk Framework

This paper attempts to construct a family risk framework for pandemic-related youth health risk behaviors, analyzing change mechanisms from multiple family levels to explain behavioral deterioration. Future research should use longitudinal tracking to examine how family risk alleviation and recovery post-pandemic affect youth health risk behaviors.

Simultaneously, understanding protective factors that maintain or promote youth health behaviors and improve risk behaviors is equally important. According to Prime et al. (2020), families are both "sources of crisis" and "safe harbors" for children, with protective factors buffering pandemic impacts and helping youth adapt to rapid environmental changes. At the parenting process level, attachment security buffered negative psychological outcomes and promoted health promotion behaviors like hand hygiene and social distancing (Coulombe & Yates, 2022; Yang, B. et al., 2022). At the caregiver level, partner support and co-parenting served as protective factors reducing distress and negative parenting risks (McRae et al., 2021). As daily routines resume, school and community support systems are reactivating. Future research should explore specific mechanisms of protective factors in families and other contexts, and urgently investigate how family risk and protective factors interact to influence youth health behaviors.

5.3 Verifying Life History Theory-Based Hypotheses

As the pandemic evolved, the family risk framework faced an "exception": why have some youth health risk behaviors not improved despite alleviated family risks? We address this by supplementing the framework with life history theory, proposing that pandemic family risks constituted environmental harshness and unpredictability during youth early development, prompting some to adopt fast life history strategies that perpetuate health risk behaviors post-pandemic. This hypothesis requires empirical verification, with several issues needing attention.

First, this hypothesis may not apply to older adolescents. Simpson et al. (2012) found that exposure to unpredictable, rapidly changing environments from ages 0–5 predicted fast life history strategies at age 23 (more sexual partners, aggressive/illegal activities), whereas exposure from ages 6–16 did not predict risk behaviors at age 23, suggesting 0–5 years may be a sensitive period. However, other research shows pandemic-related stress strengthened fast life history strategies among middle school students (Yang, Z et al., 2022), and pandemic stress predicted delay discounting in children (average age 10.33) but not adolescents (average age 17.06) (Crandall et al., 2022). This suggests that early adolescence and below may be sensitive periods for perceiving environmental changes and developing life history strategies, while late adolescents' well-developed self-awareness may reduce environmental impacts as health behaviors shift from "other-controlled" to "self-controlled" (Wu & Fang, 2006), making individual-oriented health behavior theories more applicable.

Second, the stability of fast life history strategies formed during the pandemic requires investigation. Long-term tracking studies spanning pre-, during-, and post-pandemic periods are needed to examine developmental trajectories of youth life history strategies, providing empirical support for evolutionary developmental understanding of health behavior changes.

5.4 Practical Support for Youth Healthy Development

The post-pandemic era requires diverse social support to mitigate fast life history strategy effects and improve health risk behaviors. Social support refers to material and emotional assistance from relatives, friends, colleagues, or organizations (Liu & Huang, 2010), with accompanying resources that can enhance environmental control and reduce urgency to seek immediate gratification from early unpredictability (Luo et al., 2020).

At the family level, we recommend strengthening parent-child communication to build intimate relationships. Outdoor activities and cultural events can provide opportunities for emotional expression, deepening family bonds and creating open communication atmospheres where children share their thoughts. Caregivers should attend to children' s emotional needs regarding academics and social life, providing timely support and guidance through positive language, patient listening, and understanding to create beneficial family environments. As the 20th Party Congress report emphasizes "improving school-family-society

education mechanisms" (Xi, 2022), we must strengthen coordination among families, schools, and communities to provide comprehensive support networks.

At the school level, specific curricula should teach good behavioral habits, future planning, and long-term goal importance, while social practice activities and volunteer services help students understand social responsibility and develop aspirations for positive futures. Improving home-school coordination mechanisms through digital platforms enables early identification and correction of unhealthy behaviors (Jin, 2022).

At the societal level, systematic guideline documents should help families respond to future emergencies, including emergency plans, resource integration, and professional support access, ensuring adaptability to diverse family needs for practical feasibility and flexibility.

References

Chen, H. (2022). Parent-child conflict under the pandemic: How to respond from a parent-child communication perspective? *Psychology and Health*, (8), 28–29.

Gao, Y., Wang, J., Zhao, T., & Jiang, S. (2023). Current status and correction strategies of smartphone addiction among middle school students. *Psychology Monthly*, 18(4), 79–81+84. doi:10.19738/j.cnki.psy.2023.04.021

Guan, J., & Zhou, Y. (2016). Fast and slow life history strategies: A new path to understanding psychological and behavioral differences. *Journal of Northwest Normal University (Social Sciences Edition)*, 53(6), 115–121. doi:10.16783/j.cnki.nwnus.2016.06.017

Ji, C. (2007). Adolescent health risk behaviors. *Chinese Journal of School Health*, (4), 289–291.

Jia, C., Yin, C., Ma, Y., Zhang, Q., & Li, L. (2022). A survey of ethnic minority adolescents' cognition of COVID-19. *Health Education and Health Promotion*, 17(1), 62–66.

Jin, H. (2022). Transformative education for elementary students' unhealthy behavioral habits. *Teacher Education Forum*, (6), 91.

Liao, X. (2021). *Impact of the 2019 novel coronavirus epidemic on sleep in children aged 2-12* (Master' s thesis). Chongqing Medical University.

Lin, Z., Cheng, J., Tan, J., Huang, B., Huang, Z., Xu, H., ···& Gao, Y. (2023). Mediating effect of 24-hour movement behaviors on the relationship between smartphone addiction and anxiety among college students. *Chinese Journal of School Health*, 44(1), 32–35+39. doi:10.16835/j.cnki.1000-9817.2023.01.007

Liu, R., Li, Z., Cai, S., Xian, M., & Wang, X. (2020). Children' s fruit and vegetable consumption and influencing factors during COVID-19 control period.

Chinese Journal of School Health, 41(10), 1477–1481.

Liu, X., & Huang, X. (2010). Social support and its mechanisms of action on mental health. *Psychological Research*, 3(1), 3–8.

Luo, Y., Niu, G., & Chen, H. (2020). Impact of early-life environmental unpredictability on overeating: A life history theory perspective. *Acta Psychologica Sinica*, 52(10), 1224–1236.

Wang, L., Zhou, B., Jia, F., Qian, Y., Gao, H., Ke, X., & Li, T. (2023). Expert recommendations for preventing psychological and behavioral problems and providing psychological support for children and adolescents during home quarantine/online learning (2nd edition). *Chinese Journal of Child Health Care*, 31(2), 117–122.

Wang, Y., & Feng, W. (2006). Major advances in parent-child relationship research. *Chinese Journal of Special Education*, (7), 77–83.

Wu, B., & Fang, X. (2006). Characteristics of adolescent autonomy development. *Studies of Psychology and Behavior*, (1), 22–27+54.

Xi, J. (2022). *Hold high the great banner of socialism with Chinese characteristics and strive in unity to build a modern socialist country in all respects.* Beijing: People' s Press.

Note: English references remain exactly as in the original text and are not reproduced here to avoid redundancy.

Note: Figure translations are in progress. See original paper for figures.