Research Topics

What makes leadership responsible and effective? Reinventing leadership in the COVID-19 outbreak

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What makes leadership Responsible and effective? reinventing leadership in the COVID-19 outbreak

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Editorial: What makes leadership responsible and effective? Reinventing leadership in the COVID-19 outbreak

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Editorial on the Research Topic
What makes leadership responsible and effective? Reinventing leadership in the COVID-19 outbreak

The pandemic of COVID-19 has been recognized as one of the most prevalent catastrophes of the recent period, and continued resilient leadership is needed to overcome the challenges it grants. As a result, diverse categories of leadership have taken the lead over reactions to concerns allied to COVID-19. In this way, leaders coped with the uncertainty of the crisis and offered new hope for future plans. As a result, people positively view the coronavirus, creating opportunities for progress and change.

This Research Topic entitled "*What makes leadership responsible and effective? Reinventing leadership in the COVID-19 outbreak*" introduces cutting-edge academic research and recognizes the fundamental role of leadership styles and theories in driving organizational psychology and organizational behavior theories and practices. The articles in the special issue examined a wide range of new leadership practices in organizations. We hope these articles will stimulate further research on leadership styles and theories and their application in practice. In this editorial, we offer several frameworks for thinking about styles and practices of leadership influencing organizational psychology and organizational behavior disciplines embedded with the notion of leadership, responsible leadership, and the effectiveness of responsible leadership in the COVID-19 outbreak, as shown in Figure 1. These frameworks organize the combination of articles in the special issue, identify potential gaps that merit further study, and present an agenda for future research.

The prevailing research has defined leadership as how an individual or a set of individuals impacts others to attain a common goal (Ouchi, 1980). Leaders are often considered individuals with a unique grade of eminence or authority who can change the behavior of others to achieve mutually agreed-upon goals (Pfeffer, 1977). Equally, this prominence can be ceremonial or informal, and most of the views undertaken equally by the leaders and their followers consider that the leader has some form of genuine privilege over authority (Carton, 2022). Responsible leadership also comprises making coherent choices by emphasizing the aptitude to perform responsibly. The usage of customary leadership theory partially seizes this portent because other central extents of the leader-follower association may not be deliberated. Doh and Stumpf (2005) contend that responsible leadership is a cohesive style of authority, morals, and communal accountability.

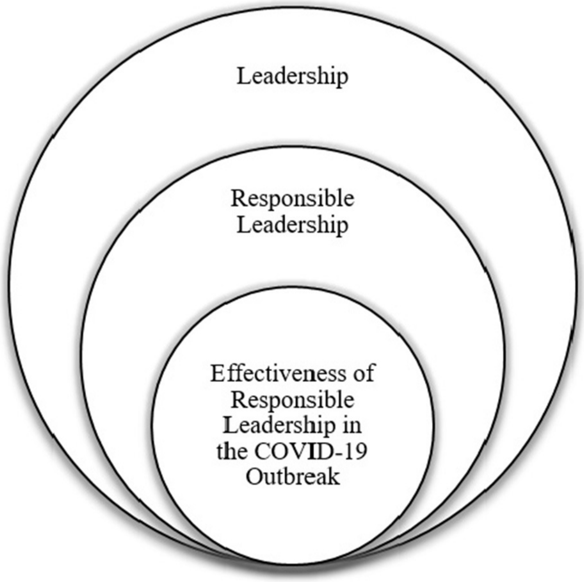

FIGURE 1
The research framework.

As the notion of responsible leadership continues to evolve, so do the underlying concerns that require addressing and explaining over theory and research. Responsible leadership signifies a concept that happens at the juncture of two prevailing aspects of research, social responsibility, and leadership (Siegel, 2014). Though much has been inscribed about social responsibility, such as its link to a business's financial performance (Orlitzky et al., 2011), little is acknowledged about how people's activities and choices influence social responsibility. Similarly, Maak and Pless (2006) claim that responsible leadership is the community and moral exchange required to overcome several contests, though further researchers propose triangulating leadership, morals, and societal accountability.

In this special issue, there are nine related articles, which comprise manifold echelons and a collection of problems concerning the effectiveness of responsible leadership in the wake of the COVID-19 outbreak.

The first article by Zhang and Tian, with case study methodology, found that the trials they confronted established the supervision's closed management desires and the learners' demands for the liberty of entrance and departure, active and supple corrective growth, firm education assessment, big data-enabled authority, and the custom of social involvement-leaning management.

The second article by Qadri et al., with the PLS-SEM method, revealed that psychological contract breach (PBC) directly leads to emotional exhaustion (EH) and indirectly leads to job insecurity (JI) and organization distrust (OD) during the COVID-19 outbreak.

The third article by Kleynhans et al. revealed the impact of authentic leadership on employee flourishing and found that authentic leadership is a substantial predictor of employee flourishing over organizational support and organizational trust.

The fourth article by Aftab et al. examined how agile leadership plays its role in managing inter-role conflicts during the chaotic period of the COVID-19 pandemic. They found that agile leadership plays a substantial role in shaping job and life satisfaction.

The fifth article by Ye et al. investigated how online interaction in philanthropic marketing influences consumer impulse buying behaviors for products during the outbreak of the COVID-19 pandemic. Their study found that the herd effect of customers and the receptiveness of vendors could endorse customers' empathy for the cultivators of the goods vended livelily. The live streamers' image and the mutual trust between customers have a tiny influence on empathy promotions.

The sixth article by Lei et al. used SERVQUAL and CCSI models and explored the features that influence customers' satisfaction and loyalty. They found that popularity and credibility, delivery time commitment, and mailing security are the key issues that impact customer satisfaction and loyalty.

The seventh article by Xiong investigated the descriptive power of economic development and environmental audits on ecological environment quality. The study found that the amount of association and impact of environmental auditing on the ecological environment are higher than the amount of association and effect of economic development on the ecological environment.

The eighth article by Han et al. investigated the impact of uncertain expectations on the consumption behavior of rural residents in China. They found that consumers' income, consumption, consumption habits, liquidity constraints, and precautionary savings equally produce the spirits of doubt and will lead to countryside customers' indeterminate prospects.

The final article by Eid et al. suggests a theoretical roadmap for the research and teaching of local crisis leadership. They worked on complex problem-solving, team interaction, team context, technology, and team training design and declared that these four features denote significant obstacles if ignored.

In conclusion, we hope that this special issue of *Organizational Psychology*, a section of *Frontiers of Psychology*, stimulates more research on reinforcement learning by bridging the micro and macro divides in leadership practices, leadership effectiveness, leadership social responsibility, organizational psychology, and organizational behavior research. Responsible leadership effectiveness in the COVID-19 crisis is a significant topic to raise awareness of the causes and consequences of the effectiveness of responsible leadership in the COVID-19 pandemic actions. It also has an influential impact on corporate governance and managers' accountability to shareholders and other stakeholders, as well as on individual leaders, i.e., how reinforcement learning activities affect leaders' reputation and career development (personal interests). We must enlarge, define, and evaluate an expansive variety of vigorous strategies, and we need to better understand the role of collaborative governance in shaping vigorous problem-solving strategies (Ansell et al., 2021). Finally, the public policy implications of reinforcement learning are also prominent, as reinforcement learning addresses the behavior and effectiveness of responsible leadership in emerging and developed economies, the responses of these entities to organizational psychology, and its impact on reinventing leadership effectiveness in the COVID-19 outbreak to enhance organizational performance.

Author contributions

FL: Conceptualization, Data curation, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Visualization, Writing—original draft, Writing—review and editing. SS: Data curation, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Writing—review and editing. MJ: Data curation, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Writing—review and editing. AO: Data curation, Investigation, Methodology, Project administration, Resources, Supervision, Validation, Writing—review and editing.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The Challenges of Chinese University Leaders During the COVID-19 Pandemic Period: A Case Study Approach

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The outbreak of COVID-19 had a profound impact on the practice of university leadership in China. This study employs a case study as the research method, interviewing five Heads of the Departments from the Z University in China to examine the challenges to leadership in Chinese universities during the COVID-19 pandemic and explores effective countermeasures. Research findings reveal that the challenges they faced manifested in the government's closed management requirements and the students' demands for freedom of entry and exit, the dynamic and flexible disciplinary development and the rigid teaching evaluation, and big data-enabled governance and the habit of human experience-oriented management. In response to these challenges, this study proposes suggestions for the Z University leaders in the post-pandemic era: establishing rules and regulations with a relaxed degree, tolerating ambiguity in online teaching, improving the ability of intelligent technology, and taking opportunities to learn.

Keywords: COVID-19, authoritarian leadership, challenges, uncertainty theory, case study

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INTRODUCTION

The outbreak of COVID-19 has had a profound impact on all sectors of society, out of which the education sector plays a special role and bears a great responsibility in fighting against the pandemic. In China, universities are often characterized by a high density of people. The majority of students' and teachers' daily routines are conducted in the form of collective activities (Yuan et al., 2018), which is very likely to cause cross-infection and transmission of COVID-19 and thus lead to social instability. Therefore, how to manage the universities has become a priority of local governments in pandemic management.

As a complex model of autonomous social organization, universities in China often experience a certain degree of uncertainty and ambiguity in both their processes and practices in terms of leadership (Liu, 2020). The sudden outbreak of COVID-19 has unavoidably exerted an influence on the leadership of Chinese universities by challenging their traditional way of governance and by slowing the momentum of the rapid development of higher education in China (Zhong and Nan, 2021). In the light of these conditions, this article aims to contribute to our understanding of Chinese university leadership in times of crisis, in particular during an ongoing pandemic, and highlights effective leadership approaches and implications for future practice.

Following the Introduction section, the current literature regarding crisis leadership and the capabilities required by leaders will be explored in the following section. The context for the study will be explained next, followed by the methodology. The findings are then presented according to the data and discussed with reference to previous research. Implications for leadership practice in universities in pandemic times are also suggested.

Literature Review

The definition of a crisis as "an urgent situation that requires immediate and decisive action by an organization and, in particular, by the leaders of the organization" (Smith, 2012, p.58) fits with the situation facing Chinese university leaders when the universities were forced to close. In a crisis, leadership ability plays an important role. Smith (2012) highlight key leadership capabilities, such as strong interpersonal communication skills, the ability to synthesize information, the capacity to empathize and respect diverse perspectives, a capacity for optimism and flexibility, and the ability to capitalize on opportunities. Shingler-Nace (2020) identifies five elements of successful leadership during this crisis: staying calm, communication, collaboration, coordination, and providing support. DuBrin (2013) discusses leaders drawing on their emotional intelligence, including empathy and compassion, in times of crisis, and Kerrissey and Edmondson (2020) highlight the importance of leaders making themselves "available to feel what it is like to be in another's shoes" (p. 7). While the literature discussed so far all have some relevance for this study, this article elaborates on the leaders' abilities to capitalize on uncertainty for this study because of its specific relevance to the COVID-19 crisis in China.

Effective crisis leaders need to be comfortable with ambiguity and disorder. To some extent, the leaders need to adjust and improvise in acknowledging that mistakes will be made, and learning needs to be ongoing (Koehn, 2020). Koehn (2020) also highlights the COVID-19 crisis as "a powerful opportunity for organizations and teams of all kinds to better understand their weaknesses, what really engages and motivates their people, and their own reason for being" (p. 5). The importance of making rapid adjustments in direction or pivoting in response to COVID-19 and being prepared to learn has also been stressed (Johnson and Suskewicz, 2020). Earlier research also highlighted the importance of crisis leaders being adaptable and flexible as well as taking opportunities that crises create to make changes (Smith, 2012; DuBrin, 2013). This ability to capitalize on opportunities can involve learning both during and after crises (Deverell, 2011). While there is already considerable literature on leadership capabilities in crisis, there is a gap in the literature on principal leadership practices in a pandemic and in particular how leaders respond appropriately in the context of autonomous social organization.

Uncertainty Theory

Uncertainty theory is developed and proposed to explain the behavior of uncertain phenomena, such as fuzziness and randomness (Liu, 2012). In organizations, there is even more reason to avoid uncertainties as they may endanger success (Kochenderfer, 2015). But at the same time, uncertainties are sought out as sources of innovation, and the ability to flexibly handle uncertainties becomes a competitive advantage (Kochenderfer, 2015). The importance of uncertainty for organizational functioning has long been recognized: "Uncertainty appears as the fundamental problem for complex organizations, and coping with uncertainty as to the essence of the administrative process" (Sun et al., 2019, p. 19). Uncertainty in governance structures is even more pronounced when there is an overlap in the powers of different organizational entities or when there are conflicts in the implementation of policies (Zhong and Yang, 2018). Take the principal responsibility system under the leadership of the party committee of a Chinese university as an example: although the party secretary and the president of the university seem to be a clear division of labor and cooperation, in the actual operation process, the boundaries between the two in terms of power, responsibility, and role are still, relatively, largely obscure.

Liu (2020) believes that the uncertainty of the university governance process is reflected in three areas: uncertainty in university decision-making, uncertainty in the execution of university decisions, and uncertainty of the effects of university decision-making implementation. Therefore, this article took the three areas of uncertainty as a theoretical observation tool and adopted the case study method to explore, analyze, and explain the dilemma and the path of resilient management in the process of the COVID-19 pandemic.

METHODOLOGY

To gain more nuanced, inclusive, and detailed perspectives on the decision-making processes of leaders in Chinese universities during the COVID-19 pandemic, a qualitative case study design was employed for this study. The research method adopted *naturalistic* strategies that paralleled how the university leaders act in the course of daily management routines during COVID-19, typically interacting with informants in a natural and unobtrusive manner (Lincoln and Guba, 1985; Rallis and Rossman, 2012).

First, case studies are a common way to do qualitative inquiry. Abercrombie et al. (1984) argue that because a case study cannot provide reliable information about the broader class, it is only useful in the preliminary stages of an investigation since it provides a hypothesis that may be tested systematically with a larger number of cases (p. 34). However, it is misleading to see the case study as a pilot method to be used only in preparing the study's surveys, because as Flyvbjerg (2001) points out, this ignores the fact that the case study produces the type of context-dependent knowledge and the possibility of epistemic theoretical construction.

Second, case study research is not sampling research, that is, a process of selecting units from a population of interest (e.g., people, organizations). The first obligation for the researcher is to understand this one case whether we study it analytically or holistically, culturally, entirely, or by mixed methods—but we concentrate, at least for the time being, on the case (Stake, 2005).

Therefore, this research has drawn attention to the question of what especially could be learned about the case of Chinese university leadership and uncertainty management during the pandemic period—an instance in time and space.

The Study Context

The Z University is an ordinary undergraduate university in Henan Province in central China, located in a historical and cultural city. The school was founded in 1973 and upgraded to an undergraduate institution in 2002 with the approval of the Ministry of Education. There are 25,000 full-time students, 1,613 faculty members, including more than 440 professors and associate professors, more than 1,200 teachers with doctoral and master's degrees, more than 100 part-time master tutors, and more than 60 outstanding experts, teaching teachers, academic and technical leaders, and outstanding teachers in Henan Province.

In China, the university implements the principal responsibility system under the leadership of the party committee. The Z University has 20 faculties and 63 undergraduate majors, covering nine major disciplines, including literature, science, engineering, law, history, education, management, economics, and art. We chose Z University as the research site because it was rated as playing a leading role in the four universities of this city in pandemic control and prevention by the municipal government.

Participant Selection

To recruit suitable research participants, we first visited Z University and identified the five departments that had played an essential role in pandemic prevention and control, including the President's Office, the Security Department, the Logistics Department, the Academic Affairs Office, and the Science and Technology Department. We then purposively invited the leader from each of the five departments who was in charge of pandemic control and management as the interviewees. In this way, a research participatory sample of five leader interviewees was selected and then individually interviewed face-to-face. All the interview data were digitally audio-recorded with the informed consent of the interviewee, and the duration of each interview ranged from 35 to 45 min.

All the interviews were semi-structured, starting with some pre-designed questions, such as "How have you led the department in managing the outbreak of COVID-19?," "What was (were) the biggest challenge(s) to your leadership in the pandemic management?," and "Has/have there been change(s) in your leadership since the outbreak of COVID-19?" While the participants verbally shared reflections on events or personal views, we also made additional, spontaneous follow-up inquiries to elicit a more detailed explanation of what and how the respondent had experienced in a bid to collect their stories, thoughts, and feelings in detail (Creswell, 2018). At the end of the interview, the president gave the author a collection of documents detailing the management of Z University during the pandemic period.

A question may arise as to whether a sample of a small number of participants would represent an adequate sampling size. This is a very common question in quantitative sociology. However, Small (2009) notes that saturation rather than representation is more important in qualitative research. Here, saturation is defined as data adequacy and means collecting data until no new information is obtained (Guest et al., 2006). An adequate sample size in qualitative research is one that permits—by virtue of not being too large—the deep, case-oriented analysis that is a hallmark of all qualitative inquiry (Sandelowski, 1995). The low level of variation we sought in the sample, and the focus on relatively high levels of homogeneity, means that it was a significant sample size—especially when additional institutional documents had been included for verification purposes.

Analysis Process

Text Encoding

In this article, NVivo 12, a qualitative data analysis computer software package produced by QSR International, was used to discuss the problems in the post-pandemic era management of Z University. The use of this software helped the research team to find the required research resources in the empirical data and summarize them more objectively. The coding of the interview data by the research group mainly included the following six specific steps. First, the empirical interview data obtained were imported into the *NVivo 12* software. Second, all imported data were analyzed and encoded one-by-one, and the parts which were highly consistent with the research topic and clearly expressed were classified into different sub-nodes, and each node was named based on the research experience. Third, we temporarily put statements that did not match the research topic of this article or were answered ambiguously by the respondents into the free node. Fourth, after all the text encoding was completed, we used *NVivo 12* to query all the text content under the specific node and read the classification results. If necessary, the name of the node, the dependency relationship, and the logical schema had been corrected and deleted. Fifth, we focused on highly repetitive text content during the encoding process. The more frequently the text appeared, the more it reflected the universal significance of the respondent's psychological behavior. Sixth, we completed the coding after combing and induction.

Text Analysis

The research group divided all coding variables into two categories: external factors and internal factors. These two classes were used as coding level one nodes, and the subsequent factors were level two. The secondary nodes of external factors included national, provincial government, and society, whereas the secondary nodes of internal factors included leadership, teachers, science and technology, and students. Through the scientific encoding of the text, 78 valid coding entries were finally obtained, from which the following 10 main nodes could be excavated: quality, government, pandemic, school, student, challenge, leadership, flexibility, scientific and technological information, and innovation. After the research group finally sorted the coding results, **Figure 1** was obtained. From the data in **Figure 1**, it can be seen that in the process of pandemic management, the feedback from the five departments focused on the following aspects: the new management model, the requirements for innovation in the management functional departments, the acceptability of information technology empowerment management, the adaptability of online teaching quality monitoring and evaluation, and the data empowerment management compares to the habits of managers.

The Legitimacy of the Study

The legitimacy of this study did not stem from the large amount of data collected, but from the sample topics obtained after scientific analysis of the experiences and ideas of a particular interviewee. This process of analysis was neither deductive nor inductive, but hypothetic (Creswell, 2018). Its purpose was to collect and analyze the narratives and views of the relevant pandemic departments of the Z University on pandemic management. This process of collecting and theorizing key data is known as a *systematic combination* (Fairbrother, 2013). Based on this, the cognitive patterns of these individuals rise to a common theme, and this purpose is to achieve the consistency of cognition in all aspects of the data collected (Stenhouse, 1977). Finally, all the topics were developed to illustrate management issues in the context of the pandemic at the Z University and to explore management strategies in the post-pandemic era.

FINDINGS

Decision-Making in Campus Control

The social crisis caused by the coronavirus outbreak means that university administrators are facing rapid changes in scenarios, enormous psychological pressures, tough time constraints, and fragmented access to information. In this spatial-temporal context, if university administrators continue to use traditional management thinking to make decisions, it will lead to a rift between institutional supply and reality: a confusion in the normal management order of the school. Peter is the manager of the security department. He mentioned in an interview reviewing how to respond to an outbreak in a short period:

> Before the outbreak of the pandemic, I was just transferred to this department. I did not feel any resistance to it. The crisis is new to everyone. I have to learn how to deal with it. I cannot get help from anyone as it is a new thing to everybody. They all "crossed the river by feeling the stones." So, no matter what I do, it all makes sense.

The main job of Peter's department is to control campus access. The local government orders the local universities and colleges to close the campus when the cases of viruses increase. In China, the students live on campus. It means that nearly 25,000 students were locked down on campus during the pandemic period. This principle of campus access control helped to manage the flow of faculty members and students and to decrease the possibility of cross-infection with the virus.

The Z University enacted the principle of *the person who gives approvals is the person who takes charge of the campus access management*. That is, the leader of each department is responsible for controlling the physical flow of its faculty members and students and for reducing and minimizing any unnecessary arrivals or departures from the campus. However, it limited the freedom of students. According to the president of the Z University, Sam,

> closed management is required from the government. However, there is no official interpretation available to the idea of "*closed*." To reduce any possibilities of cross-infection of the virus, we adopted a strict campus control policy which has limited the freedom of students.

We furthered our inquiry to clarify the meaning of "*freedom*" mentioned by the leader and he replied to the question with great detail about the physical freedom of the students. Among the details that he offered, an example about beauty salons turned out to be very typical and apposite in explaining his views on students' freedom. According to Sam:

> for university students, especially female students, they go outside the campus for hairdressing and nail salons before the university was closed. Now, the students were forbidden to leave campus during the pandemic. They cannot easily be satisfied with the only two salons on campus.

We inquired further about how the Z University dealt with this. Sam continued by saying:

> According to students' psychology, first, we tried to find ways to clearly explain the reason to the students, so that the students can subjectively accept the state's control requirements, which is good for society, for everyone, and for individuals. The second is that we try to provide as many services as possible on campus, such as temporarily introducing more barbershops.

The interview data indicate that the university leader referred to the freedom of the students to their living needs. He comments that if students were locked down for a longer time, it would become a political issue.

> Western countries may judge China to have no human rights if we closed the universities for a very long time. Western countries do not like wearing masks. Recently, in Xi'an city, students cried that "we want to go outside" after 11 pm in a university. Then someone posted it online so that the whole world knew that China restricts students' rights. It became a political issue. So, we would help students to realize that it is an ideological and political issue. The government and the university closed the university for your good, and for the good of society and this country. Second, we would satisfy their needs. Third, we would change our plan according to the situation, for example, we would let them go outside between 7 am to 8 pm when the cases reduce to zero in this city. (Sam)

Peter, the manager of the Security Department, responds with a similar view of students climbing over the wall:

> Students' ideas are strange. When students were allowed to go outside the university, they would not go out to have a meal. However, the university now is closed. The students want to go out to have a meal. Some students have this mentality: in four

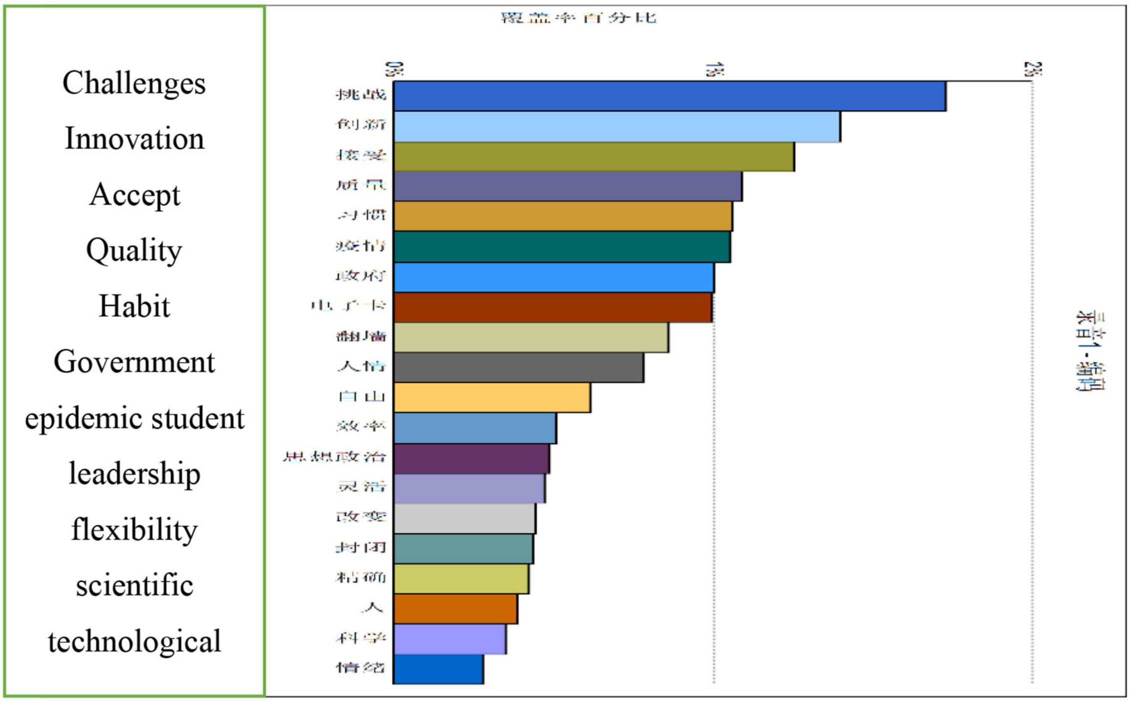

FIGURE 1 | The percentage of the nodes.

> years studying in university, it is a regrettable thing that none of them has yet climbed over the wall of the university to venture outside the campus (a way to show they are pursuing freedom). Even if they are caught by us, students still want to climb over the wall at least once.

In the interview, Lucy, the manager of the Logistics Department, could not understand why students wanted to climb over the wall. She further comments:

> Teachers and students think, "there is no case of the virus in this city, why does the university not allow us to go out?" People on the outside also questioned, "why does the university not allow us to freely go to the university?" It is this emotion that spreads among each other. We have no way but to leave these problems unsolved.

Execution of University Decisions of Online-Teaching

In pandemic prevention and control, the Z University adopted a dual plan model in teaching to ensure the effective operation of the university. The leaders required that online teaching should offer a replacement when classes could not be held normally in physical classrooms. In interviews, the manager of academics, Isaac, believed that the shift in teaching mode from offline to online has greatly improved the efficiency of the school.

> By looking at the data that the system already has, we can see how many times each student submits the homework. Now the tasks assigned by the teacher can be reflected. On the online platform, we have the basic data of each student and lecturer's activity in the classroom. Of course, I can verify these basic data. I also know whether a teaching resource transmitted by the teacher is useful or useless for the course. Maybe the lecturer would upload some information just to improve his performance. I also can observe the lecturer's behavior. Therefore, to evaluate the course is very simple, we check the students' homework at the end of the semester.

The administrator believed that teaching evaluation becomes simpler, which underestimates the nature of complexity and changeability in academic evaluation. Later, according to the documents dealing with the prevention and control of Covid-19, this research group found that cameras were arranged in each classroom. It was convenient for the administrators of Z university to monitor a lecturer's offline teaching at any time.

The Effects of University Decision-Making in Big Data-Assisted Management

The Z University required all staff and students to strictly abide by the *daily report* regulation. That is, all the in-service faculty members, including part-time ones, and the students were required to report their daily health data (whether they had a high fever, cough, fatigue, breathing difficulties, or other special symptoms, and their body temperature) to the university *via* a temporary data app developed by the university. Furthermore, the Z University arranged a special group of staff to collect data on vaccinations among the students and faculty members. The Z university aimed to get clearer vaccination information for pandemic control and to encourage those students and staff who have no contraindication to the vaccines to get vaccinated.

However, it was very hard to popularize big data-assisted leadership before the outbreak of COVID-19, as expressed by the manager of the Science and Technology Department, Patrica:

> It is our innovation to develop the app *Dingding* for pandemic control. The university leaders did ask us to invent the app at the beginning because it was too urgent for them to think of the idea, given that the outbreak of COVID-19 was very unexpected and sudden. What they asked us to do upon the outbreak was to do a brainstorm and think about what else we could do for pandemic control. Based on my very limited knowledge, the Z University was the first university in this region to apply big data-assisted apps on pandemic control.

On the positive side, the sudden outbreak of the novel coronavirus has driven the Z University's data-driven approach to COVID-19 governance.

> Patrica: I think the big change is that there is an improvement in accepting the technology in management.
>
> Question: Was it not accepted before the pandemic?
>
> Patrica: It was not accepted.
>
> Question: Are you sure?
>
> Patrica: Yes, there was not much acceptance before. I thought it was due to inertia.
>
> Question: What do you mean?
>
> Patrica: Ideologically speaking, for example, if a department changed a younger leader, he may not have known that there was a better way to improve the efficiency of the management. If you suggested to him to use the data to collect the information, he would not be willing to listen and not be willing to learn and he would think you have changed his habits.

DISCUSSION

Several frameworks of crisis leadership were discussed in the earlier literature review. However, none seemed to adequately describe or explain the leadership approaches taken by the leaders in this study. In this section with reference to existing literature, three leadership practices, drawn from the three stages of decision-making presented in the findings, will be discussed. Implications for future crisis leadership practice will also be signaled. These practices have the potential to contribute to a new framework for Chinese university leadership in times of a pandemic and provide useful guidance for principals and other senior leaders in their responses.

Establish Rules and Regulations With a Relaxed Degree

The manager's reference to "*crossing the river by feeling the stones*" and "*not being able to get help from others*" reflects the nature of crisis decision-making. Under enormous time and psychological pressure, managers' decisions often stem from intuition, preferences, and experiences (Liu, 2020). Peter's reaction to the crisis is to solve the pandemic problem by rules. Therefore, he set up the rules contained in the *Pandemic Prevention and Control Work Plan* (the 6th edition). Reasonable rules and regulations contribute to the clarity and standardization of university management. University governance may seem chaotic, disorganized, and in a state of *anarchy*, but it is *organized* after all (Zhong and Yang, 2018). In the rules, students were required to stay at the university. However, the construction of the system must enable a leeway, and it is necessary to seek a combination of a rigid system and flexible management.

Students climbing over the wall occurred because of the lack of a flexible response to student freedom in the rigid closed management of the Z University. The strict closure of the school led to students' depression and inconvenience, resulting in the occurrence of this adverse event. Rigid management pursues a strict system and strengthens the constraints on teachers and students to meet the requirements of the government. However, if flexible management is integrated into it, it is more scientific and reasonable. Flexible management focuses on the humane care of teachers and students, giving emotional warmth and care, in order to improve the sense of belonging of teachers and students to the school, rather than ignoring the repeated appeals of students.

Considering the particularity of the pandemic, the change of management mode should be adjusted according to the development trend of the pandemic, that is, the adjustment from the *wartime state* of the pandemic to the *normalization* and back to the *wartime state* of the pandemic, and the change should be based on the repeated changes of the pandemic. This requires that the rules and regulations of the university be relaxed. Giesecke (1991) points out that in an organized anarchy institution, leaders sometimes need to break the rules and regulations to increase the flexibility and innovation of the institution. Therefore, university leaders need to have enough leadership to judge the situation, adapt to changes, and break the rules.

Improve the Ability of Intelligent Technology

The internal organization of the university itself is huge and complex, coupled with the impact of the pandemic environment, which puts forward a more severe test for the governance ability of university leaders. In response to the call of the state to launch big-data-empowered pandemic management, the Z University is transitioning from the traditional management based on personal experience to the management model of big data empowerment, so university leaders should pay special attention to the training and cultivation of individual information literacy, and improve the individual's understanding and application ability of intelligent technology. In addition, previous research suggests establishing the awareness that data is the lifeline of decision-making in a situation of uncertainty and forming a research team of specialized institutions with data literacy to achieve common governance of education is vital (Lan, 2021). Whether constrained by the pandemic or other factors, university leaders should use their professional sensitivities to strengthen problem awareness, improve data literacy, and transform business problems into data problems to understand the complex issues in university governance in a more comprehensive, proactive, and systematic level.

Tolerating Ambiguity in Online Teaching

Evaluation is an exploratory activity with typical uncertainty and complexity characteristics. The quality of teaching simply cannot be guaranteed exactly by the completeness of the instructional videos watched by the students, or by the frequency with which the teacher uploads the materials. Therefore, the production of knowledge requires universities to establish a relatively loose organizational structure, and the evaluation of courses should be dynamic and scientific. The lack of ideological awareness of teaching quality by the teaching administrators of Z University, the closeness of the teaching governance environment during the pandemic period, and the rigid teaching management at the subject level that does not conform to academic laws. Therefore, the Z university should consider preparation for future crises as well as taking opportunities to reflect on what could be changed and embracing different perspectives in a bid to maximize learning.

On the contrary, in the face of the high complexity and uncertainty of the external environment, tolerating ambiguity in university governance can bring to the university more flexibility, including more growth for the future development of new things. In this way, university decision-makers can have more autonomy and make better decisions. James (2006) points out that the university should be an emotional, relationship-focused organism, not a calculating, rational mechanical device. Therefore, the Z university should highlight the essential attributes of knowledge production, actively exert the autonomy of discipline construction, and mobilize the enthusiasm of teachers to participate in discipline governance.

Limitation and Strength

There might be one perceived limitation that the argument of the article is generated from such a small sample size of a case study with only five research participants given that the case study merely portrays a single instance locked in time and circumstance of the Z University and is thus essentially conservative. As, Smith (2018) argues, generalizability is often identified as a limitation or weakness of qualitative research with smaller sample sizes. However, we argue that the small research sample might also be a research strength. A small qualitative sample enables us to research the pandemic governance practices of the five leaders from Z University in rich detail and to provide "a thick description or depth of understanding" (Palinkas, 2014, p. 851). This is also one of the distinct strengths of qualitative research—to gain in-depth insights and understanding of humankind, social materiality, and life phenomena.

CONCLUSION

This small-scale study explored the perceptions of the Z University in the pandemic of COVID-19 on their leadership practices. This study contributes to our understanding of leadership in a pandemic by highlighting three areas of leadership practices that the president and others in leadership roles may wish to reflect on. These are preparing for crises by establishing rules and regulations with a relaxed degree, tolerating ambiguity in online teaching, improving the ability of intelligent technology, and taking opportunities to learn at all stages of the crisis. All these practices will assist in strengthening trusting relationships within the university, increasing their ability to recover. Many of these practices are also relevant to everyday leadership practice and it is to be hoped that, despite the challenges posed by the COVID-19 pandemic, opportunities will be taken to strengthen leadership practices.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

AUTHOR CONTRIBUTIONS

XZ contributed to the conception, design of the study, organized the database, performed the statistical analysis, and wrote the first draft of the manuscript. XT validated the statistical analysis, wrote and revised sections of the manuscript, contributed to manuscript revision, read, and approved the submitted version. Both authors contributed to the article and approved the submitted version.

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Unpaid leave on COVID-19: The impact of psychological breach contract on emotional exhaustion: The mediating role of job distrust and insecurity

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This research intends to increase awareness of the existence of psychological breach contracts on emotional exhaustion in the context of a prolonged COVID-19 pandemic, with the function of organizational distrust (OD) and job insecurity (JI) serving as mediating factors. We used partial least squares structural equation modeling (PLS-SEM) to look at the 437 questionnaires that private sector workers in Pakistan filled out during the COVID-19 outbreak. The findings of direct and indirect effects show that (PBC) psychological breach contract directly leads to emotional exhaustion (EH) and has a significant indirect relationship through job insecurity (JI). Moreover, psychological contract breach (PBC) directly leads to emotional exhaustion (EH) and has a significant indirect relationship through organization distrust (OD). The study shows both theoretical and practical implications, as well as areas where more research needs to be done.

KEYWORDS

COVID-19, psychological breach contract, emotional exhaustion, job distrust, job insecurity

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Introduction

After COVID-19, the world was hit by a terrible and unexpected crisis that had a big impact on every part of life. Some of the things that were done to stop the spread of the epidemic were a lockdown and isolating people from each other, both of which led to the collapse of the company (Karim et al., 2020; Fernandes, 2020). The closing of industries caused a lot of bad things to happen at work, like people quitting on their own, being suspended for a short time, having their hours cut back, and taking paid or unpaid leave (Gössling et al., 2020). Ali and Çobanoglu (2020) admit that businesses in the tourism, transportation, and hospitality industries were hit hard. Foo et al. (2020) also confirmed that thousands of people in the various industries lost their employment or were forced on unpaid leave. Most airlines, like Cathay Pacific and Singapore Airlines, sent their employees on leave without pay. ILO (2020) argued that more than 25,000 workers, or a mandatory unpaid leave of 75% of all employees, should be covered by this policy. Aside from the airline industry, the pandemic caused a lot of trouble in the service industries. Because there weren't enough customers, about 23,000 Vietnamese workers had to take short vacations. 340 people who worked at restaurants in New Zealand had to be fired (ILO, 2020). The unpaid vacation made the employee angry, which made the employee's breach of the psychological contract worse. Research shows that PBC has a big effect on how productive employees are and how likely they are to leave their jobs. Additionally, Zanzibar's labor rules enable flexibility for businesses to lay off their employees without liability if they allow unpaid leave for a month, and after this time period, an additional 3 months. Two conditions must be met for a corporation to be permitted to lay off its employees, as stipulated by the labor laws. Firstly, when a business is unable to pay its personnel owing to economic difficulties, Additionally, should there be a force majeure, such as a pandemic, things will be delayed until the force majeure has passed. As a result of the outbreak, hotels, tour operators, and restaurant owners placed their personnel on many months of unpaid leave. Hence, it is necessary to investigate how such psychological contract breaches can result in organizational distrust, job insecurity (JI), and emotional exhaustion (EH).

Research on PBC previously focused on the connection between the PBC and the identity of the organization, engagement and loyalty in the workplace, and performance at work (Li et al., 2016). Chen and Wu (2017) did an analysis of the PBC's role as a mediator in the relationship between leadership styles and the wish to leave the organization. PBC has a direct impact on the feeling of happiness and accomplishment (Ampofo, 2020). Likewise, the study of Karatepe et al. (2020) also focused on increasing intention to work and engagement in proactive activity.

Therefore, related studies provide a clear knowledge of the effect of PBC on employee distrust (ED) and turnover intentions. However, the studies on PBC and the COVID-19 pandemic condition are quite rare. In this regard, this research aims to improve the awareness of the existence and impact of psychological breach contract (PBC) on emotional exhaustion (EH) in the situation of a prolonged COVID-19 pandemic, with a mediating role of organization distrust (OD) and job insecurity (JI). The main goal of the study was to check on the PBC during the COVID-19 pandemic in the private sector of Pakistan. As far as we know, this pandemic affects all sectors, but in Pakistan, the private sector employees are hit the hardest. They are instructed to either take unpaid leave or leave the company. That makes them feel very bad about the company. Pakistan is a developing nation where there are no explicit norms and regulations governing employee rights. Therefore, this study is useful for determining whether companies violated the psychological contract with their employees during the COVID-19 pandemic. In such a precarious financial state, it is extremely difficult for enterprises in developing economies to pay full wages. Even in the developed world, many businesses give unpaid leave to their employees. The study is significant from both a theoretical and practical standpoint. Theoretically, it confirms whether private sector employees were affected by the COVID-19 epidemic and whether they considered there was a psychological breach of contract. In practice, the government may have the chance to address this issue among private sector employees and provide them with economic and psychological help. In the meantime, the government might be able to set rules and guidelines for unpaid leave in the private sector. The study has the following research objectives:

- To identify the impact of PBC on emotional exhaustion in the COVID-19 Pandemic.
- To study the impact of PBC on emotional exhaustion with the mediation role of organization distrust (ID) and job insecurity (JI) in the COVID-19 Pandemic.

The remaining sections of this work are organized as follows. In the section titled "Related literature and hypothesis development," we create a conceptual model of the study and related literature. Measurements and data gathering are contained in the "Materials and methods" section. The Results and Findings section contains the study's analysis. In addition, the discussion section contains a discussion of the results, study limitations, and imperial implications. Finally, the last section gives the study's conclusion.

Related literature and hypothesis development

Perceived contract breach and employees outcomes

Contemporary organizations need to be aware of their employees' attitudes and behaviors to figure out PBC. Everyone knows that the PBC depends on the rule of reciprocity. Both the employees' and the employer's hopes are met, which creates a connection between the two. In today's world, organizations have fewer resources and are under more pressure to stay profitable and competitive (Arunachalam, 2020). Individuals expect a return on their contributions to the organization as a result (Balabanova et al., 2019). PBC is always higher when an employer doesn't do what they said they would do, either directly or indirectly (Arunachalam, 2020). PBC is when an organization doesn't live up to some of the promises it made about an employment arrangement, either directly or indirectly (Morrison and Robinson, 1997). Li and Chen (2018) and Shen et al. (2019) found that studying the PBC can lead to a number of inappropriate and adverse outcomes, such as absenteeism, counterproductive work behavior, intention to leave, and stress, which is not good for organizations. Other studies have shown that when people are exposed to the PBC, they may experience anxiety, depression, exhaustion, and a sense of injustice.

Using social exchange theory (SET; Blau, 1964) as a basic framework, the current study examines how lack of reciprocity may occur in the setting of JI and OD. SET is one of the most popular ways to think about how employees react in organizations. A social exchange consists of a sequence of encounters between an employer and an employee that establishes mutual obligations. Most people think that these interactions depend on and are affected by what other people do (Cropanzano and Mitchell, 2005). These transactions may involve activities, material or intangible resources, as well as social and economic repercussions. Employer-employee relationships can be conceptualized as an exchange of benefits, costs, resources, and outcomes. So, we can use this framework to understand the relationship between employer and employee. Fundamental to social exchange theory is the notion that an individual develops a social relationship on the basis of mutually advantageous partnerships (Qadri et al., 2022).

According to Greenhalgh and Rosenblatt (1984, p. 438), job insecurity (JI) is the "perceived inability to sustain desired continuity in a threatened job position." In particular, those who experience insecurity fear losing their jobs. The Job Insecurity Index (JI) might be considered a source of resource loss because it indicates the fear of losing a specific job and the psychological implications of this subjective experience. Especially when an employer doesn't do what they promised to do for their employees, it may show that the employee isn't important to the employer and make the employee feel less safe about their job (Cavanaugh and Noe, 1999; Restubog et al., 2006). Furthermore, seeing PBC as a cause of job insecurity is similar to the COR's (Hobfoll, 2001) view that people are more likely to lose resources again if they have lost them once.

H1: PBC is positively related to job insecurity (JI).

When a psychological contract is broken, the continuous cycle of giving and receiving is broken, and the employee's loyalty to the company and its goals is diverted (Cassar and Briner, 2011). Cassar and Briner (2011) concluded that people are willing to put in a lot of work because they believe that organizations will keep their promises. This has created a psychological contract that keeps the cycle going. It is commonly recognized that when employees perceive a breach of a psychological contract, they respond negatively. This makes people think that their companies don't have integrity, which makes people feel bad about them (Sarikaya and Bayrak Kök, 2017). Employees are reported to feel dissatisfied upon discovering a breach of the psychological contract, therefore decreasing their organizational commitment and performance over time (Bunderson, 2001). Therefore, if the psychological contract is violated, employees may lose faith in the organization. Consequently, the following hypothesis is put forward:

H2: PBC is positively related to employees' distrust toward organizations.

The employee-employer relationship is best described by the psychological contract theory (Reyes Flores et al., 2019). On the other hand, employees experience a psychological contract breakdown (Morrison and Robinson, 1997) when their companies don't meet what they think are mutual promises. This causes stress and, eventually, work strain (Gakovic and Tetrick, 2003). Russell and Mehrabian (1974) established that a person's body, or internal state, reflects and responds to information about their environment. Any changes that a company wants to make to how its workers do their jobs could be the stimulus (Goi et al., 2018). The PBC was a good forecaster of how workers would feel, so the breach will make workers feel bad (Piccoli and De Witte, 2015). As a result, we proposed this point.

H3: Employees' PBC is positively related to their emotional exhaustion (EH).

Poor job performance, job satisfaction, psychological wellbeing, and employee turnover are all linked to job instability (Cheng and Chan, 2008; Staufenbiel and König, 2010; De Witte et al., 2016). According to the COR hypothesis (Hobfoll, 1989), a person may become emotionally exhausted if they perceive a threat to their resources and do not receive sufficient gains in return. During the COVID-19 pandemic, restaurant frontline workers' perceptions of JI could be a risk to their resource loss and increase their EH, since losing their jobs could lead to bad things like depression (Kessler and Walters, 1998). As a result, the following hypothesis has been proposed:

H4: Job insecurity (JI) is positively related to emotional exhaustion (EH).

Because of its significance in evoking good employee reactions and behaviors at work, trust between an employee and their supervisor (DeConinck, 2010; Jiang et al., 2019) has long been a significant problem in the modern world. Similarly, employees have a level of trust in their bosses, coworkers, and the organization/company as a whole (Susskind et al., 2003; DeConinck, 2010). Supervisors and coworkers are social partners for employees at work (Susskind et al., 2003; Loi et al., 2014).

Employees who are hated and feared should experience EH for a variety of reasons. Low levels of trust may amplify stress, resulting in a greater level of EH (Maslach et al., 2001;

Halbesleben and Buckley, 2004). Lewicki and Bunker (1996) say that building trust leads to reciprocity, which lowers EH in the workplace and vice versa.

H5: Organization distrust (OD) is positively related to employees' emotional exhaustion (EH).

Conceptual model of the study

Considering the above hypotheses (H1, H2, H4, and H5), we further suggested that job insecurity (JI) and distrust (JD) will serve as mediating mechanisms that interpret the independent variable impact (PBC) on the outcome (emotional exhaustion) as shown in **Figure 1**. When a company doesn't do what it says it will do for its employees, it may mean that the company doesn't value the employee. Because of this, it's more likely that people's sense of security in their jobs and relationships with their companies will go down (Cavanaugh and Noe, 1999; Restubog et al., 2006) and will continue to worsen, which will result in a decline in trust placed in the organizations. The COR's (Hobfoll, 2001) idea that losing a resource once makes people more sensitive to losing it again is consistent with the idea that PBC is a cause of insecurity. We say that an initial loss from PBC leads to a second loss in the form of job insecurity for the employee (JI). On the other hand, treating PBC as a source of distrust is consistent with SET (Blau, 1964), which believes in reciprocal relationships between an employer and employees. Studies in the extant literature have evidenced that trust in organizational factors has a significant association with major employee affective and cognitive responses such as burnout, wellbeing, job satisfaction, psychological distress, mental health, and commitment (see for example; Loi et al., 2014; Karatepe and Olugbade, 2017). Hence, the following hypotheses can be derived from the foregoing research and theoretical reasoning.

H6: Job insecurity (JI) mediates the relationship between psychological contract breach (PBC) and emotional exhaustion (EH).

H7: Organization distrust (OD) mediates the relationship between psychological contract breach (PBC) and emotional exhaustion (EH).

Material and methods

Measure

This study used all previous related measures. Five elements from Robinson and Morrison (2000) list of psychological contract breaches (PBC) were adopted. Five items from Moore's (2000) study were used to measure emotional exhaustion (EH). JI was measured in the study of Karatepe (2013). In addition, the items of OD were adapted from Adams et al. (2010). Each question was scored on a Likert scale ranging from 1 to 5, with 1 indicating strong disagreement and 5 indicating strong agreement. For the purpose of determining the content validity, three experts were consulted: three from the industry and three from academia. Some of the elements were changed as a result of expert recommendations. The screening questions were designed to identify only those employees who were on unpaid leave from the department and industry. In the end, 30 employees took part in a pilot study. According to Cronbach alpha, the instrument's reliability was tested at greater than 0.70.

Data collection

In order to get information from Pakistani employees, we carried out a cross-sectional survey. The researchers asked people to take part in their studies using two methods: snowball sampling and purposeful sampling. The sample was taken from people who work in the private sector in Pakistan. Because of the state's influence, employees in the government sector rarely face pay problems. Therefore, only personnel from the private sector were included in the final analysis. Respondents were assured that they would remain anonymous and that they could choose

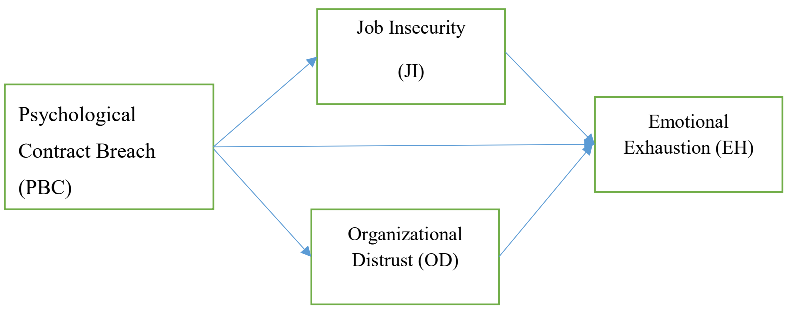

FIGURE 1
Conceptual model of the study.

whether or not to take part in the study. The questionnaire was distributed online to respondents in September 2020. And only those respondents who responded by 30 November 2020 were considered final. After removing missing data and answers from people who didn't care, 437 questionnaires were left that could be used to further study. This sample size satisfies the requirements for the needed sample size (Ali et al., 2021). Based on the demographic information, 58.6% of the respondents were men. In comparison, 41.4% of respondents were women, 62.7% were between the ages of 19 and 26, 28.8% had a master's degree, 88.6% were from cities, and 305 respondents were single as shown in **Table 1**.

TABLE 1 Demographic.

Variable	Category	Distribution	
		Frequency	Percentage
Age	19–26	274	62.7
	>26–33	91	20.8
	>33–40	46	10.5
	>40–47	6	1.4
	>47–54	11	2.5
	>54–61	7	1.5
	>61	2	0.5
Gender	Male	256	58.6
	Female	181	41.4
Education	No formal education	6	1.4
	Primary (year 5)	3	0.7
	Secondary school certificate (year 10)	2	0.4
	Higher secondary school certificate (year 12)	20	4.6
	Undergraduate (year 16)	116	26.6
	Masters (year 18)	126	28.8
	MBBS or BDS	133	30.4
	DVM	12	2.7
	BE	3	0.7
	Others	16	3.7
Income [a]	45,000–55,000	177	40.5
	>55,000–65,000	36	8.2
	>65,000–75,000	79	18.1
	>75,000–85,000	30	6.9
	>85,000–95,000	32	7.3
	>95,000–105,000	27	6.2
	>105,000	56	12.8
Location	City	387	88.6
	Suburb	16	3.7
	Village	34	7.8
Marital status	Single	305	69.8
	Married	117	26.8
	Divorced	12	2.7
	Widowed	3	0.7

[a] Income is given in Pak Rupee (exchange rate: USD 1 = 165 PKR).

Results and findings

Constructs and underlying dimensions were verified using a principal component analysis (PCA) in SPSS 24.0 (Costello and Osborne, 2005). Several ways were used to look at the PCA results (Kaiser, 1974; Field, 2017). The results showed a good KMO value (KMO = 0.91), and the Bartlett test was statistically significant ($p < 0.05$). In light of these findings, we can proceed with further component analysis because there is a strong correlation between samples and items (Kaiser and Rice, 1974). From 0.527 to 0.777, the communalities show that each item had a good amount of shared variation. Eleven parts were taken out based on the root mean (Eigen value) criteria. These 11 factors explained 52.99% of the total variation, which is more than the minimum criteria, or >50%, and is therefore acceptable (Beavers et al., 2013). In the same way, each individual component explained between 4.23 and 12.77% of the difference. This meant that each factor contributed the same amount to the total variance explained and that no single factor could have dominated the total variance explained (i.e., more than 50%) or caused common method bias (Podsakoff et al., 2003).

For further analysis, each item had to be looked at very closely. Things that had a factor lead of less than 0.40 were immediately taken out of the analysis (Hair, 2010). To get rid of things with low factor loading or cross-loading, an iterative process was used. Items were kept in the final round if their factor loadings were between 0.712 and 0.869. **Table 2** gives a brief overview of what PCA found.

Convergent validity and discriminant validity of constructs

Factor loading (Wixom and Watson, 2001), composite reliability (Nunnally, 1978; Burns et al., 2016), and average variance extracted (Fornell and Larcker, 1981) were used to figure out the convergent validity of the measures, while the HTMT ratio was used to figure out the discriminant validity (Henseler et al., 2015). The AVEs ranged from 0.618 to 700, and the CR ranged from 0.854 to 0.875, all of which met the predetermined criteria (i.e., $\lambda \geq 0.4$, AVEs ≥ 0.5, and CR ≥ 0.7).

Structural model analyses

The structural model hypotheses were tested using partial least squares structural equation modeling (PLS-SEM) with Smart PLS v.3.0. PLS-SEM is known for being mostly flexible, but strict when it comes to getting reliable and valid results (Sarstedt et al., 2016). PLS SEM is a great way to look at data in many business and management studies because it has a high

TABLE 2 EFA, composite reliability, and AVEs.

Constructs	Items	Standardized loadings	AVE	α	CR
Psychological contract breach			0.700	0.785	0.875
	PCB 1	0.834			
	PCB 2	0.869			
	PCB 3	0.806			
Job insecurity			0.661	0.745	0.854
	JI 1	0.795			
	JI 2	0.832			
	JI 3	0.811			
Organizational distrust			0.692	0.779	0.871
	OD 1	0.801			
	OD 2	0.825			
	OD 3	0.869			
Emotional exhaustion			0.618	0.796	0.866
	EE 1	0.801			
	EE 2	0.859			
	EE 3	0.766			
	EE 4	0.712			
KMO measure of sampling adequacy			0.910		
Bartlett's test			0.000		
Total variance explained			52.99%		

statistical power when the data isn't normally distributed and is more tolerant of the data assumptions of heteroscedasticity (Hair et al., 2016). Also, PLS-SEM is a better way to test complex and highly intertwined relationships with multiple direct and indirect effects in a population of car buyers who may not be spread out in the same way. For this study, this is important.

Before the main analysis of estimating direct and indirect paths, the results showed that there was no multicollinearity among the latent constructs because the variance inflation factor (VIF) scores for the latent constructs were well below the cut-off value of 10 (Hair, 2010). The bootstrap method was used to do a path analysis with 5,000 bootstrapped samples and 95% bias-corrected bootstrap intervals (Hair et al., 2016). In the sections that follow, both direct and indirect estimates are shown in **Table 3**.

Model fit indices

Covariance-based structural equation modeling (CB-SEM) makes it easy to test model fit indices to figure out how well a model works. This is not the case with Smart PLS (Hair et al., 2016). You can get a good idea of how good the model is by finding out how it compares to others. Model fit indices can be used with R2 values to find out how strong a model is and how well it predicts. Model fit indices like standardized root mean square residual (SRMR) and root mean square theta (RMS-theta) have been used to measure how good an ESCCB model based on VBN theory is. The SRMR is the difference between the correlation that was seen and the correlation that was predicted by the model (Hair et al., 2016). As an absolute measure of how well the model fits, it uses the average number of differences between the correlation that was seen and the correlation that was expected. SRMR helps find and fix any mistakes in the specifications of the model (Hair et al., 2016). The SRMR value of a model that fits well is 0.10 or 0.08 (Hair et al., 2017). RMS-theta is a way to measure the root mean squared residual covariance matrix of the outer model error terms (Lohmöller, 1989). This measure has been used to check how well a model fits because it is suggested when the model only has reflective measures (Hair et al., 2016). RMS-theta should be close to zero, and it is thought that a good model has a value of 0.12 or less (Hair et al., 2016). The results show that PBC explains 45.9% of the difference in EH through JI and 69.8% through organization distrust.

Estimates of direct effects and indirect effects

The estimates of direct and indirect effects show that PBC directly leads emotional exhaustion (EH) ($\beta = 0.38$, $p < 0.05$) and has a significant indirect relationship through job insecurity (JI) ($\beta = 0.198$, $p < 0.05$). On the other hand, PBC directly leads emotional exhaustion (EH) ($\beta = 0.401$, $p < 0.05$) and has a significant indirect relationship through OD ($\beta = 0.143$, $p < 0.05$) as shown in **Table 4**.

Discussion

The goal of this study was to find out how unpaid leaves during COVID-19 affected emotional exhaustion (EH) directly and indirectly through job insecurity (JI) and distrust of the organization (OD). As a result, we generated seven hypothesis. The H1 and H2 hypotheses were supported, indicating a positive relationship between PBC and JI and OD. The findings indicated that the PBC exacerbated their intention toward employees' job insecurity and their thought regarding OD as a result of the unpaid leave granted in COVID-19. The earlier research are confirmed the same results, indicating the PBC increases negative related to JI and OD (Piccoli and De Witte, 2015; Costa et al., 2017). Our hypothesis H3, H4 and H5 are confirming that PBC, JI and OD is positively related to EH. These relations were in line with what was found in earlier research on OD and plans to leave (Kim and Yang, 2017; Sarikaya and Bayrak Kök, 2017; Kang et al., 2018). Moreover, Hypothesis H6, H7 are also confirming that Job insecurity (JI) and organization distrust (OD) mediate the relationship

TABLE 3 Model 1a: Direct, indirect, and total effects.

Predictor (X)	Mediator (M)	Dependent variable (Y)	Direct effect	Indirect effect	Total effect	*p*-value	R^2	f^2	Q^2
Psychological contract breach	Job insecurity	Emotional exhaustion	0.385 *(0.291, 0.466)*	0.198 *(0.142, 0.258)*	0.583	0.000	0.459	0.207	0.192
	Organizational distrust		0.401 *(0.301, 0.495)*	0.143 *(0.098, 0.258)*	0.544	0.000	0.698	0.224	0.204

Values in parenthesis and italics in direct and indirect effects columns are lower and upper bound bias-corrected confidence intervals of the estimates obtained as a results of bootstrapping procedure.

TABLE 4 Model 1b: Intercorrelations, variance inflation factor (VIF), and discriminant validity of the constructs.

Constructs	VIF	A	B	C	D
Psychological contract breach	1.599, 1.519	*0.836*			
Job insecurity	1.514, 1.456	(0.687) 0.530**	*0.813*		
Organizational distrust	1.368, 1.291	(0.554) 0.435**	(0.514) 0.392**	*0.832*	
Emotional exhaustion	1.535	(0.355) 0.290**	(0.364) 0.289**	(0.328) 0.266**	*0.786*

** Correlations significant at p < 0.01. Values in parenthesis and italics in direct and indirect effects columns are lower and upper bound bias-corrected confidence intervals of the estimates obtained as a results of bootstrapping procedure

between PBC and employees EH during the COVID-19 Pandemic. These findings confirming the prior research (Loi et al., 2014; Karatepe and Olugbade, 2017). Organizational mistrust resulting from a breach of the psychological contract may indicate that employees expected management to make better judgments to protect them and to react more effectively. Guo et al. (2017) showed that managers' decisions could cause distrust in an organization. During the 2011 political crisis in Egypt, the vast majority of tourism industry employees planned to abandon their jobs. They stopped believing in their organization because their uncertain situation made it impossible for them to do their jobs (Elshaer and Saad, 2017).

Limitation and future direction

This study has certain limitations and proposes some future directions. First, this study only looked at people who work in the private sector. In the future, researchers may get data from other government and semi-government employees to get a better idea of how things work in general and make the results more general. Second, many other psychological factors may also have an effect during a pandemic. Further studies could also be conducted to compare the PBC with other emotional factors to figure out why people take unpaid leaves. Lastly, this study only looked at data from the COVID-19 pandemic. More research could be done during different political and economic crises to confirm the results in a more generalize way.

Practical implications

The current study has many implications for managers in the real world. The main point of this study is that organizations need to be proactive about managing the psychological contracts of their employees. This is because employees' perceptions of unfulfilled organizational promises can lead to OD, JI, and EH. To this end, prior studies suggest several measures that both can either prevent or mitigate the negative consequences of organizational contract breaches (e.g., Chih et al., 2016). For instance, providing authentic information during recruitment process, career development, making realistic promises, and helping managers to effectively manage and understand employees organizational promises perceptions. Next, the study findings suggests two important underlying mechanisms i.e., feeling of JI and employees distrust between perception of PBC and EH. These findings reveals that when employees experiencing contract breaches, employees are likely to feel more insecure about their employment and also feeling of distrust on their management may be observed. Consequently, employees turn to be feel more exhausted in such situations. Hence, managers should be more sensitive to the promises been made with their employees. It might help to take more remedial actions to reduce the effects of broken contracts on JI, OD, and EH. For example, managers can ask for an honest apology or a clear explanation of why a contract was broken, and they can also bring up any other opportunities and work continuity. These kinds of explanations might help employees feel less upset about psychological contract breaches (Morrison and Robinson, 1997).

Conclusion

This present study emphasized on the important role of employee's perception of psychological contract breaches on emotional exhaustion via job insecurity and distrust. The findings suggest that PBC positively predict negative outcomes such as job insecurity (JI), employees distrust (JD), and emotional exhaustion (EH). Further, the results confirm the important role of two underlying mechanisms i.e., JI and distrust between PBC and employees emotional exhaustion (EH). These findings further enrich the literature on employees PBC, and suggest managers numerous ways to mitigate its impact on their workers in the organizations. Future, research scholars may conduct other researches in their own cultural context to check whether they could observe the similar results or not.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

SUQ, ML, and ZM contributed to the conception and design of the study. SQ and MU organized the database. SQ performed the statistical analysis. CY wrote the first draft of the manuscript. SUQ, ML, ZM, CY, SQ, and MU wrote sections of the manuscript. All authors contributed to manuscript, read, and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Authentic leadership and flourishing: Do trust in the organization and organizational support matter during times of uncertainty?

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Orientation: This study investigated the influence of authentic leadership on employee flourishing while considering the potential mediating effect of trust in the organization and organizational support as underlying mechanisms in an uncertain setting.

Research purpose: To examine the relationship between authentic leadership and employee flourishing by evaluating the indirect effect of organizational support and trust in the organization as potential mediators.

Motivation for the study: An authentic leadership approach, organizational support, and trust in the organization may influence the flourishing of employees in uncertain times. Increasing the comprehension of the possible interaction effect of organizational support and trust in the organization in the relationship between authentic leadership and employee flourishing may improve individual and organizational efficiency.

Research approach/design and method: A quantitative, cross-sectional survey design was applied in this study. The sample comprised 314 employees in a noteworthy South African steel manufacturing entity. The Authentic Leadership Inventory, Workplace Trust Survey, Flourishing-at-Work Scale, and the Job Demands-Resources Scale were administered.

Main findings: The findings of this study suggest that authentic leadership was a significant predictor of employee flourishing through organizational support and trust in the organization.

Practical/managerial implications: This research illuminates the potential value-adding contribution of an authentic leadership style in promoting a trust-filled relationship between team members and their organization and the support they experience from their employer. Despite the prevailing precarious context, working under the mentioned conditions might result in the increased flourishing of employees.

Contribution/value-add: The analyses of the mentioned relationships might assist businesses in optimizing the resources required to improve employee and organizational performance. Additionally, the exploration of organizational support in conjunction with organizational trust raises our understanding of the possible influence these elements can have in enhancing employee flourishing in the workplace.

KEYWORDS

authentic leadership, flourishing, trust in the organization, organizational support, precariousness

Introduction

The 21st-century international economic climate has been characterized by organizational pressures and challenges in order to adhere to stakeholder requirements (Hameed and Sharma, 2020). Apart from the other difficulties that business entities have faced, the outbreak of the COVID-19 pandemic brought additional challenges that needed to be navigated. COVID-19 (also called the coronavirus) was declared a global disease outbreak of worldwide concern on 30 January 2020 and then a pandemic on 11 March 2020 (World Health Organization [WHO], 2020b). With more than 200 countries and territories as well as most organizations being affected by around 441 million cases and fatalities exceeding five million (Worldometer, 2022), the COVID-19 pandemic continues to be one of the most significant global crises of the modern era (World Health Organization [WHO], 2020a). Its worldwide effect is visible in the more than 157 million cases in Europe, over 149 million in the United States, more than 118 million in Asia, and over 11 million in Africa (Worldometer, 2022). Despite the increasing number of COVID-19-related research studies, organizations are troubled by the uncertainties accompanying the pandemic (Gostin and Wiley, 2020). Governing bodies, policymakers, and researchers are increasingly concerned about the adverse effect that COVID-19 can have on business management practices and the international economy (Amankwah-Amoah, 2020).

The influence of the ongoing global health dilemma, together with the international efforts to try and contain the virus, has not only affected the worldwide economy and human health, but also complicated the careers and working life of countless individuals (Restubog et al., 2020). The pandemic has brought about abrupt changes in the workplace (e.g., remote working and virtual teamwork), while affecting the work-life of employees (e.g., social distancing, anxiety, and job insecurity) (Kniffin et al., 2021). The anxiety of individuals has, furthermore, been kindled by profoundly emotional messages, disturbing images, and broadly reported death tolls (Peters, 2020).

Additionally, the pandemic and the resulting changes may have resulted in workplace-related uncertainty due to followers feeling concerned about the future of their employer, their working conditions, and the security of their jobs (Chirumbolo et al., 2021; Obrenovic et al., 2021). While being in an employment relationship during times of uncertainty, the unpredictability and precariousness may still lead to employees experiencing anxiety and stress (Ererdi et al., 2021; Greyling et al., 2021) that can adversely influence their emotional and psychological well-being in the short term and can cause burnout over the medium to long term (Dewey et al., 2020). In support of previous research suggesting that an uncertain and insecure work context has a negative impact on team member health and well-being (Standing, 2011; Utzet et al., 2020), recent studies have emphasized the adverse effects of COVID-19 on job satisfaction, well-being (Bakker and Van Wingerden, 2021), and social relations (Möhring et al., 2021). Moreover, the International Labor Organization mentioned that the costs related to psychological health complications are equivalent to 3–4% of the European Union's gross domestic product (Organisation for Economic Co-operation and Development, 2012). Chisholm et al. (2016) posit that psychological health difficulties result in an annual loss in productivity of an estimated $925 billion. When considering these costs, a clear need exists for research on the identification of psychological health predictors (Caesens et al., 2021). Because employees spend many hours at work, the way employers treat and value their employees has a prominent effect on their well-being, both inside and outside of the workplace (Eisenberger and Stinglhamber, 2011).

Huppert and So (2013) state that hedonic and eudaimonic well-being are components of employee flourishing and that flourishing employees are able to handle uncertainties and challenges more effectively than those who are not flourishing (Schotanus-Dijkstra et al., 2016). The importance of follower well-being is reiterated in a study by Krekel et al. (2019), which suggests that employee well-being is positively linked to organizational performance and team member productivity. Safeguarding the well-being of employees has, thus, become a primary focus area for most business owners during the pandemic (Deloitte, 2020). This study extends the existing knowledge base by developing a more nuanced understanding of selected factors that may affect flourishing as these manifests within a post-COVID work environment characterized by uncertainty and volatility.

Amid uncertain and challenging conditions, such as the COVID-19 period, the role of leaders is imperative (Baran and Woznyj, 2020; Rath et al., 2021), as followers depend on them for support and guidance. During COVID-19 the role of the leader changed from face-to-face interaction to having virtual interactions, limiting the time spent on one-to-one interactions and opportunities to support employees. Farhan and Wright (2021) stressed the importance of a leadership model that create a culture of care and trust in uncertain times. According to Wang et al. (2014), authentic leadership is a positive leadership style that can be described as a transparent, moral, and genuine approach that can make a constructive contribution during periods of precariousness. Although authentic leadership has generated interest among researchers, there seems to be limited research involving the relationship between authentic leadership and employee well-being (Inceoglu et al., 2018), especially in volatile times. Authentic leaders have the ability to positively affect team member trust in the organization, intrinsic motivation, job satisfaction, and commitment (Miniotaite and Buciuniene, 2013; Tabak et al., 2013) and may add value in times of uncertainty. Furthermore, Yijia and Jinhong (2016) maintain that authentic leadership is positively associated with perceived organizational support. Imran et al. (2020) found perceived organizational support to be linked positively to flourishing and work engagement. Flourishing, trust in the organization, and career progression were also found to be associated with perceived trust in the workplace (Caesens et al., 2017). Rautenbach and Rothmann (2017b) indicate that organizations can benefit when promoting authentic leadership, as the flourishing of their employees will be enhanced.

Tuzovic and Kabadayi (2021) posit that, while endeavoring to identify the factors that may have an impact on employee well-being, researchers have applied the job demands-resources (JD-R) model (Bakker and Demerouti, 2007) in many well-being-related studies. Subsequently, the JD-R model was also used in this study. According to the principles of the JD-R model, having applicable job resources available when job demands are high will benefit the organization (Bakker et al., 2007). To this end, applying the JD-R model approach could be to the advantage of the entity where this study was conducted, as it was functioning in challenging circumstances. Outside forces, including technology, certain factors in the business environment, and government regulations, may affect job demand and resource levels (Bakker et al., 2003). When the mentioned external factors change, it may result in a change in the demands and resources of employees, which can influence their well-being (Brauchli et al., 2013). Due to the possibility that workplace well-being can increase when the job resources at team members' disposal may capacitate them to reduce the impact of job demands (Bakker et al., 2014), it may be advantageous to find and apply identified job resources to mitigate the effect of job demands (Lesener et al., 2019).

Very little, if any, research is available on these specific constructs during times of uncertainty, in this case during a global pandemic. The central research question that can be asked is whether authentic leadership will positively influence employee attitudes in times of uncertainty? We know that authentic leadership is a positive predictor of organizational support (Aria et al., 2019; Baykal, 2020), trust in the organization (Stander et al., 2015; Coxen et al., 2016), and flourishing (Chevalier et al., 2021; Kleynhans et al., 2022). However, it is not clear to what extend the impact on each other play in a model incorporating all the constructs. Consequently, the link between perceived organizational support and organizational trust as serial mediators between authentic leadership and flourishing needs more investigation. Considering the gaps illustrated above, the aim of the paper is to reveal the linkage between authentic leadership, organizational support, trust in the organization, and flourishing in uncertain times. The paper seeks to answer the following: (a) What is the potential value of authentic leadership in the way employees experience organizational support, trust in the organization, and flourishing during times of uncertainty? (b) Will authentic leadership strengthen employees' perceptions of organizational support, thereby enhancing their trust in the organization and, consequently, furthering higher levels of flourishing?

This paper aims to make three main contributions to the existing body of knowledge. First, it intends to enrich the leadership literature by identifying how authentic leadership affects work-related attitudes in terms of the experience of organizational support, leading to trust in the organization, and flourishing of employees in uncertain times. Second, the paper deals with the chain of effects between authentic leadership, organizational support, trust in the organization, and flourishing and captures the expected positive effect caused by authentic leadership. Third, practical implications for leaders will be discussed.

Literature review and hypothesis

The relationship between authentic leadership and organizational support, trust in the organization, and employee flourishing

The notion of flourishing has become one of the most notable multifaceted well-being-related models (Keyes, 2002; Seligman, 2011). Flourishing consists of two components, namely, hedonic and eudaimonic wellness. Hedonic wellness refers to positive emotions and a life filled with good feelings, while eudaimonic wellness relates to how individuals nurture their abilities to function well in their everyday life (Keyes, 2006). Keyes and Annas (2009) state that flourishing encompasses the subjective well-being of persons, involving psychological, emotional, and social features.

Flourishing in a work context can be separated into flourishing, mental well-being, and languishing

(Rautenbach and Rothmann, 2017a). A person's mental health state can be measured across a continuum. Individuals who flourish are plotted at the one end of the continuum and those who languish at the other end (Keyes, 2002). As can be deduced, those with a positive state of mental health are at the higher end of the spectrum and deemed to flourish. Employees who flourish at work feel well (i.e., they are content with their job and have positive emotions, perform psychologically well) (i.e., are devoted and determined and find purpose at work), and are socially well-adapted (i.e., are socially accepted, make social contributions, and are socially growing) (Rothmann, 2013). Individuals who are in a languishing state of being are at the lower end of the mental health spectrum. According to Keyes (2006), most individuals experience a moderate mental health state and are located between a languishing and a flourishing state on the spectrum. The well-being of individuals is not only viewed as a desirable end state in psychological terms but improving the well-being of employees is also regarded as beneficial for business and, thus, something to aspire to (Schotanus-Dijkstra et al., 2016). The contribution that well-being can make in the workplace is demonstrated by findings that it relates to work engagement (Diener et al., 2003; Bakker and Oerlemans, 2011; Ariza-Montes et al., 2018), career development (Rosenbaum et al., 2011), hope for the future (Pleeging et al., 2021), and improved productivity (Oswald et al., 2015). Authentic leaders are likely to cultivate positive social exchanges, they can have a positive effect on team member well-being, as positive social exchanges enhance well-being (Ilies et al., 2005).

According to Rego et al. (2016), authentic leadership originated from the constructive perspective and action of leaders who positively influenced their followers. Authentic leadership grants a framework of positive, trusting, and ethical leadership (Kiersch and Peters, 2017). Even though authentic leadership has been described in numerous ways and analyzed in several studies (Gardner et al., 2011), the definition most often employed is the description proposed by Walumbwa et al. (2008): "A pattern of leader behavior that draws upon and promotes both positive psychological capacities and a positive ethical climate to foster greater self-awareness, an internalized moral perspective, balanced processing of information, and relational transparency on the part of leaders working with followers, fostering positive self-development" (p. 94).

According to the description, authentic leadership consists of four dimensions, namely, self-awareness, internalized moral perspective, balanced processing, and relational transparency (Banks et al., 2016). Self-awareness relates to the awareness of, and trust in, an individual's values, cognitions, and motives. Internalized moral perspective points to behaving in accordance with one's true self rather than displaying behavior directed at gaining the favor of external parties or avoiding some form of punishment. Balanced processing pertains to the unbiased processing of available information that includes relevant knowledge during decision-making without contradicting, manipulating, or overstating available evidence. Lastly, relational transparency refers to the self-disclosure of an individual, the person's genuine convictions and emotions, and the establishment of trust-based associations. Authentic leadership is an original, ethical, and transparent leadership style known for its positive approach during times of uncertainty (Wang et al., 2014). When displaying authentic leadership behavior, such as a positive moral perspective, elevated awareness, and timely and clear communication, leaders can inspire team members to achieve work-related goals (Crawford et al., 2020).

Authentic leadership was also found to predict organizational support (Vermeulen, 2017; Gojny-Zbierowska, 2018; Aria et al., 2019). According to Eisenberger et al. (1986), perceived organizational support is defined as "employees in an organization form global beliefs concerning the extent to which the organization values their contributions and cares about their well-being" (p. 500). However, organizations have different ways of expressing to its employees that it values their contribution and that it cares for their well-being (Kurtessis et al., 2017). One way of demonstrating to employees that the organization cares about their well-being is through its leaders because they can influence the connection that employees feel toward the organization (Kurtessis et al., 2017). To this end, Cropanzano et al. (2001) determined that fairness and an inspirational and supportive leadership style is a strong predictor of perceived organizational support. The results from a recent study conducted by Kurian and Nafukho (2022) suggest that authentic leader can create high levels of perceived fairness due to the climate they create for their team members. Moreover, authentic leaders might have a positive effect on employee behavior due to the support and assistance that they provide to employees to develop and perform at their best (Ilies et al., 2005). Lastly, because authentic leaders are self-aware, have high moral standard and build transparent relationships, they can build positive relationships with followers, while inspiring and encouraging them to achieve their goals (Deshwal and Ali, 2020). It is thus plausible to suggest that authentic leadership associates with organizational support.

A study conducted by Chen and Sriphon (2022) indicated that authentic leadership was linked positively to both social exchange relationships and trust. Furthermore, an authentic leadership style can promote a healthy and supportive work setting characterized by sound relationships and trust among team members, follower trust in their leaders (Asad et al., 2021), and in their organization (Miniotaite and Buciuniene, 2013; Alkaabi, 2018; Kleynhans et al., 2021a). It is thus plausible to argue that increased levels of trust can be ascribed to the example set by authentic leaders who are characterized by high moral standards, honesty, transparency, and integrity.

Recent studies found that authentic leadership could be beneficial to organizations, as it was associated with a variety of positive end results, such as follower creativity, team member performance (Duarte et al., 2021), consumer focus, personnel retention (Ribeiro et al., 2020), and employee flourishing (Nair et al., 2021; Kleynhans et al., 2022). Ryff and Keyes (1995) maintain that when leaders exhibit behavior linked to the dimensions of authentic leadership (self-awareness, internalized moral perspective, balanced processing, and relational transparency), they can influence the well-being of employees. For example, self-awareness and balanced processing could assist followers with increases self-acceptance, personal growth, and the mastery of their environment, while relational transparency should lead to positive relationships in the workplace.

Considering the information provided above, it can be argued that an authentic leadership approach can have a positive influence on employees' perceptions regarding the support provided by the organization, their trust in the organization, and their levels of flourishing. Accordingly, the following hypothesis was formulated:

> **Hypothesis 1:** authentic leadership positively influences (a) organizational support, (b) trust in the organization, and (c) employee flourishing.

Organizational support as a mediator in the relationship between authentic leadership and employee flourishing

Organizational support theory was introduced in 1986 by the American social psychologist Eisenberger, who maintained that perceived organizational support was represented by follower perception of the value that an organization attached to followers' contributions and the care it demonstrated for their well-being (Eisenberger et al., 1986; Sun, 2019). When applying the social exchange theory, perceived organizational support implies that followers provide the employing organization with their capabilities, time, attitude, and efforts for favorable treatment from the employer (remuneration, development, career advancement, support, etc.) (Kurtessis et al., 2017). The support that organizations provide to their employees assists in meeting their own needs and demonstrates their willingness to supply the employee with material and other support.

Based on the principle of reciprocity, how organizations treat their employees can influence perceived organizational support, which, in turn, will have an impact on employee attitudes and behavior (Sun, 2019). When team members, thus, perceive that the company has their best interests at heart, demonstrated by its commitment and support, they are likely to reciprocate by showing loyalty and adopting the actions and attitudes required by the company (Sun, 2019). Examples of the support organizations can provide to their employees include how they react to employee health issues, the errors that employees make, and their performance (good or bad), their provision of meaningful and challenging work, the provision of employee benefits, and payment of a fair wage (Sun, 2019).

Authentic leaders can influence the climate within an organization (Woolley et al., 2011) and the well-being of team members by means of different mechanisms (Ilies et al., 2005). Because of their open and honest communication, and the trust and sincere interest these leaders have in their team members (Gardner et al., 2005), they cultivate a positive and safe climate where followers can feel free to express themselves (Nelson et al., 2014). The perception of employees regarding the support provided by their leader, who is considered by them as a representative of the organization, is hereby positively influenced resulting in them extending that perception to the organization.

Previous research indicated that perceived organizational support can be linked to the enhancement of job satisfaction and flourishing while reducing the stress levels of employees (Kurtessis et al., 2017). According to Ho and Chan (2022), and in line with the organizational support theory (Kurtessis et al., 2017), perceived organizational support was identified as a prominent contributor to employee flourishing. These findings imply that when followers perceive that their organization or their leader appreciates their contribution, values their well-being, and demonstrates support, these employees will likely experience increased levels of flourishing. Based on this discussion the following hypothesis was formulated:

> **Hypothesis 2:** organizational support mediates the relationship between authentic leadership and employee flourishing.

Trust in the organization as a facilitative mechanism in the relationship between authentic leadership and employee flourishing

Trust is an essential aspect of any human relationship, and although there seems to be no unanimously accepted description of trust, scholars tend to agree on the key defining features that describe trust. Accordingly, Rousseau et al. (1998) posit that trust can be described as a psychological state that consists of "the intention to accept vulnerability based upon positive expectations of the intention or behavior of the other" (p. 395). Trust includes an element of risk perception (Siegrist et al., 2021), while being a future-oriented state shaped by the actions and behavior of another party (Corbett and Le Dantec, 2018). In an organizational context, trust can be classified as interpersonal and impersonal. Examples of interpersonal trust are trust in colleagues and in leaders, an example of impersonal trust is trust in the organization (Güçer and Demirdağ, 2014; Haynes et al., 2020; Oliveira et al., 2020). When considering previous research studies, trust in leaders has frequently been investigated (Ullah et al., 2019) and trust in colleagues somewhat less (Bachmann et al., 2015). Trust in the organization is, however, a relatively new phenomenon that requires more in-depth analysis (Jaškevičiūtė, 2021) and is one of the constructs used in this study.

When trust in the workplace is diminished, it can function as a barrier, resulting in increased vulnerability, heightened caution among employees (which leads to diminished levels of effort), and, thus, reduced benefits flowing from team member efficacy (Bandura, 2001; Dirks and Ferrin, 2001). To this end, trust in the organization is represented by the trust stakeholders (including employees) have in an entity and includes perceived factors such as the fairness and transparency of actions, processes, and procedures (Rawlins, 2008; Schnackenberg and Tomlinson, 2014). Additionally, the way companies are true to their word also plays a vital role in perceived trust. Trust in the organization refers to a setting where positive attitudes/viewpoints, elevated performance, and collaboration are highly likely (Brown et al., 2014). Trust in the organization and trust in its leaders were found to associate with vital outcomes, which included organizational commitment (Baştuğ et al., 2016), organizational citizenship behavior (Singh and Srivastava, 2016; Dhiman and Sharma, 2021), employee performance (Ekhsan and Saroh, 2021), knowledge management and organizational performance (Fitria, 2020), and employee well-being (Jaškevičiūtė, 2021).

Research indicates that a trusting relationship is established through the social exchange between parties (Wang et al., 2019). The social exchange theory involves the processes and principles related to the exchange of treasured social and psychological commodities (Cross and Dundon, 2019). A key concept of social exchange theory is that participants in a relationship feel obliged to reciprocate the commodities at their disposal because they are inspired to safeguard the balance between inputs and outputs to preserve a social transaction equilibrium (Buchanan, 2021).

The prevalence of trust in the organization can have an impact on work-related outcomes by influencing how employees appraise the anticipated behavior of the business (Dirks and Ferrin, 2001; Adnan et al., 2018). When the future actions of an organization are perceived positively by employees, the resulting trust in the organization can lessen the negative impact of the uncertainty that may prevail (Dirks and Ferrin, 2001), having a positive impact on employee outcomes such as well-being. Research studies determined, among others, that perceived trust in the organization was positively associated with employee well-being (Kurtessis et al., 2017; Imran et al., 2020; Ho and Chan, 2022), employee retention (Baranchenko et al., 2020), job satisfaction (Andriyanti and Supartha, 2021), employee performance (Shabbir et al., 2021), and organizational performance (Imran and Aldaas, 2020). Conversely, when employees perceive that they are treated unfairly by the organization, their confidence and trust in the organization will likely suffer, leading emotional exhaustion and reduced employee well-being.

According to Kleynhans et al. (2021a), there is a positive relationship between trust in the organization and authentic leadership, while Paolini et al. (2020) found an association between trust and well-being during times of uncertainty. Because authentic leaders can be described as those "who are deeply aware of how they think and behave and are perceived by others as being aware of their own and others values/moral perspectives, knowledge and strengths; aware of the context in which they operate; and who are confident, hopeful, optimistic, resilient, and of high moral character" (Avolio et al., 2004, p. 4), it can be argued that authentic leadership associates with trust and the well-being of employees. Additionally, the possible mediating effect of trust in the leader on the relationship between authentic leadership and the attitudes and behaviors of employees in the workplace has been confirmed in previous studies (Wang and Hsieh, 2013; Agote et al., 2016). The following hypothesis was thus formulated:

> **Hypothesis 3:** trust in the organization mediates the relationship between authentic leadership and employee flourishing.

Testing the simultaneous, serial mediating effect from organizational support to trust in the organization in the relationship between authentic leadership and flourishing

This study investigated the relation between authentic leadership, Flourishing, organizational support, and trust in the organization during times of uncertainty.

While the prevalent challenges in the world economy, society, and the labor environment have resulted in the occupational environment being increasingly precarious, the outbreak of the COVID-19 pandemic worsened the situation, putting the health and well-being of individuals at risk (Giunchi et al., 2019; Alradhawi et al., 2020; Jajodia et al., 2020; Rajendran et al., 2020). Many business entities were affected negatively by the outbreak of the coronavirus pandemic and were forced to implement measures to contain the spread of the virus, while adversely affecting their business processes and outcomes (Donthu and Gustafsson, 2020; Sohrabi et al., 2020). Because individuals had to start practicing social distancing and self-isolation and limit their travels to try and contain the spread of the virus, it affected organizational activities (Nicola et al., 2020) and possibly the well-being of individuals negatively.

Drawing on the JD-R model, followers require appropriate resources that will equip them to cope with challenges in the workplace (Bakker and Demerouti, 2007; Schaufeli, 2017). The well-being of employees is likely to improve if they have adequate resources at their disposal to face taxing job demands. In contrast, when employees are confronted with high work demands and have insufficient resources, it may have a negative impact on their well-being.

Many researchers support the notion that effective leadership is vital in times of uncertainty and insecurity because the organization and its followers need the support and encouragement of their leaders to guide them through these precarious conditions (Dirani et al., 2020; Li et al., 2020). Researchers have also suggested that the leadership of an organization can substantially influence follower well-being (Fullagar and Kelloway, 2012; Rahimnia and Sharifirad, 2015). Influential leaders will encourage positive outcomes through their authentic engagement with team members in an organizational setting (Park et al., 2017). Conversely, leaders who exhibit inauthentic behavior and fail to create a supportive environment will adversely affect the well-being of team members (Bhandarker and Rai, 2019).

In an attempt to mitigate the challenges that modern organizations face, as well as enhance positive individual and organizational outcomes, an interest in positive leadership styles such as authentic leadership has been the focus of recent studies (Sidani and Rowe, 2018; Weiss et al., 2018). Because authentic leadership as an influential resource (Adil and Kamal, 2019; Adil et al., 2019) can promote the resources necessary for team members to confront challenging work demands, it may be an effective leadership approach under these conditions. The focus on authentic leadership during difficult times may be due to the positive characteristics such as resilience, confidence, optimism, transparency, ethical behavior, and future-oriented viewpoints that authentic leaders exhibit (Daraba et al., 2021). These qualities may affect employee and organizational outcomes positively.

Baykal (2020) posits that authentic leaders exhibit empowering qualities and can influence organizational support perceptions and organizational commitment positively. Additionally, perceived organizational support has been identified as a job resource (Hobfoll et al., 2018) and found to predict increased trust in the organization (Chen et al., 2005). Improved organizational trust is likely brought about by the perception of followers that the business is concerned about their welfare, appreciates their effort and contribution, and will do its best to meet their needs. Jaškevičiūtė et al. (2021) found a direct and an indirect relationship between trust in the organization and employee well-being. Trust in the workplace is recognized as an important job resource (Alcoba and Phinaitrup, 2021), as it can enhance motivation levels and foster employee well-being.

It is likely that employees who feel supported may experience a measure of benevolence that has been found to be a predictor of trust (Colquitt et al., 2007; Lapidot et al., 2007). If employees feel that they are treated with compassion and kind-heartedness it might cause them to experience psychological safety. The increased level of psychological safety could likely result in employees spending more time and energy on their work as opposed to devising strategies to find additional resources. Because employees feel supported and psychologically safe, they might reciprocate with increased levels of trust in the organization. Moreover, it can be argued that employees who feel supported and cared for could experience heightened levels of emotional well-being because they do not feel unsafe and without the necessary resources. Changes are that they will have more energy to focus on the task at hand and feel more motivated and engaged which points to components of psychological well-being. Lastly, because trust is relational in nature, employees who trust may reciprocate, as suggested by social exchange theory, resulting in enhanced positive teamwork and more harmonious interpersonal relations that could enhance social well-being.

According to Sun (2019) the way organizations treat their employees may influence their experience of support, which, will have an impact on employee attitudes. By integrating the arguments above, it is possible to argue that when authentic leadership enhances the employee perceived organizational support, they feel more trusting toward the organization because they are of the opinion that the organization has their best interest at heart and wants to see them develop and be successful, which eventually leads to their enhanced level of flourishing. The rationale for postulating that the sequential mediation of organizational support and trust in the organization in the relationship between authentic leadership and employee flourishing is thus plausible. We propose that employees who experience their leaders as authentic are likely to flourish in their jobs, firstly because they appreciate the support they receive, and secondly, they trust that the organization have their best interest at heart. Therefor it is desirable to suggest and test the sequential mediation chain so as to accurately understand how authentic leadership has an effect on flourishing. Flowing from this discussion, the following hypothesis was formulated:

> **Hypothesis 4:** perceived authentic leadership is indirectly and positively related to flourishing, sequentially mediated through first organizational support, and then trust in the organization.

Materials and methods

Participants

This study focused on the managers employed at a prominent South African steel manufacturing organization. The target group consisted of 570 potential participants, and 314 of the candidates participated, culminating in a 55% response rate. Data collection was performed in 2020 by applying stratified random sampling.

The respondent characteristics were as follows: a total of 41.7% of the respondents were between 51 and 60 years of age. The majority of the participants (64.7%) stipulated that they functioned at the senior management level, while 19.1% specified that they had 11 to 20 years of service. A smaller portion of the participant population (24.2%) indicated that they had 11 to 20 years of experience in their current job.

Measures

Participants were requested to complete a biographical information document together with the survey to appraise authentic leadership, organizational support, trust in the organization, and employee flourishing.

Employee perception of authentic leadership characteristics was measured by administering the Authentic Leadership Inventory (ALI; Neider and Schriesheim, 2011) to measure four subdimensions: self-awareness, internal moral perspective, balanced processing, and relational transparency. An example item is "My leader uses his/her core beliefs to make decisions". The individual items (14 in total) were scored on a five-point Likert-type scale, ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Previous research in a South African setting confirmed a Cronbach's alpha value of $\alpha = 0.93$ (Stander et al., 2015) for the ALI. The ALI was successfully applied in a study by Crawford et al. (2020).

Organizational support was measured by using the seven-item related part of the Job Demands-Resources Scale (JDRS) instrument developed by Jackson and Rothmann (2005). An example item is "Does your work give you the feeling that you can achieve something?". The items were appraised on a scale ranging from 1 (*never*) to 4 (*always*). The Cronbach's alpha reliability coefficient was 0.88 (Rothmann et al., 2006). The Job Demands-Resources Scale was applied with success in a study by Cornelisse (2021).

One scale of the Workplace Trust Survey (WTS) (Ferres and Travaglione, 2003) was used to measure trust in the organization (11 items), which was scored by means of a seven-point Likert scale, ranging from 1 (*strongly disagree*) to 7 (*strongly agree*). An example item is "There is a widely held belief that my organization is moving forward for the better" (Ferres and Travaglione, 2003). A recent study that applied the WTS in a South African setting reported a composite reliability coefficient of.96 (Kleynhans et al., 2021b). Ramdas and Patrick (2019) administered the WTS successfully in their research.

The Flourishing-at-Work Scale – Short Form (FAWS-SF), consisting of 17 items in total, was employed to capture the frequency of specific symptoms experienced during the preceding month on a six-point scale, ranging between 1 (*never*) and 6 (*every day*). Psychological well-being (nine items, e.g., "How often did you get excited when you perform well on your job?") reflects the frequency of psychological wellness. Emotional well-being (three items, e.g., "How often did you feel grateful?") indicates the frequency of feelings of emotional wellness. Social well-being (five items, e.g., "How often did you feel that you really belong to your organization?") represents the frequency of social wellness feelings. Previous research in a South Africa setting reported reliability values ranging between 0.77 and 0.89 (Rautenbach and Rothmann, 2017a). The FAWS-SF was applied with success in research conducted by Heyns et al. (2021).

Many survey designs state single single-method bias as a limitation. In this study, single-method bias was mitigated by limiting the number of items in the research questionnaire, applying different response set-ups (Podsakoff et al., 2012), and phrasing the questions clearly and concisely (Podsakoff et al., 2003). Additionally, participants were made aware of their anonymity, contributing to honest answers (Steenkamp et al., 2010). Finally, standardized questionnaires were utilized.

Statistical analysis

Descriptive statistics and correlation analyses were computed to describe the data and the sample characteristics. As Cronbach's alpha does not provide a reliable estimation of scale reliability when factor loadings differ (Raykov, 2009; Wang and Wang, 2020), we did not compute alpha coefficients, but preferred to compute omega reliability coefficients instead. A cut-off value of.70 for scale reliability, as proposed by Nunnally and Bernstein (1994), was used.

Latent variable modeling in Mplus 8.8 (Muthén and Muthén, 1998–2022) was used to test the measurement and structural models. The variables were considered continuous, and as there were no missing values, the mean-adjusted maximum likelihood (MLM), which is robust to the non-normality of data (Wang and Wang, 2020), was used as an estimator. Model fit was evaluated by means of the following indicators: the chi-square statistic (the test of absolute model fit), Tucker-Lewis index (TLI), comparative fit index (CFI), root mean square error of approximation (RMSEA), and standardized root mean residual (SRMR). TLI and CFI values with a minimum threshold of.90 are acceptable, although values of.95 or higher are preferred; RMSEA and SRMR values lower than.08 indicate a close fit between model and data (Wang and Wang, 2020). In addition, the Akaike information criterion (AIC), which is meaningful when estimating different models, and the Bayesian information criterion (BIC), which indicates model parsimony, were also used to appraise the fit of competing models. Lower AIC and BIC values point toward better fit (Wang and Wang, 2020).

For mediation analysis purposes, a serial multiple mediator model, as proposed by Hayes (2017), was employed using Hayes's PROCESS macro as preferred regression-based path analytic technique (Hayes, 2017). To establish whether dependent variables were indirectly affected by independent variables via mediating variables, bootstrapping (5000 samples) was used to construct two-sided bias-corrected 95% confidence

TABLE 1 Fit statistics for the competing measurement models.

M	Chi-square	*df*	TLI	CFI	RMSEA	SRMR	AIC	BIC
1	1826.53*	1111	0.906	0.911	0.045	0.055	37078.10	37689.25
2	1840.20*	1115	0.905	0.910	0.046	0.055	37086.14	37682.30
3	1997.18*	1114	0.884	0.890	0.050	0.059	37260.86	37860.77
4	2010.76*	1118	0.883	0.889	0.050	0.059	37268.90	37853.80

df, degrees of freedom; TLI, Tucker-Lewis index; CFI, comparative fit index; RMSEA, root square error of approximation; SRMR, standardized root mean square residual, $^*p < 0.01$.

TABLE 2 Descriptive statistics, reliabilities, and correlations of the scales.

Variable	Mean	*SD*	*p*	1	2	3
1 Authentic leadership	3.61	0.65	0.98	–	–	–
2 Organizational support	3.13	0.48	0.78	0.64		–
3 Trust in the organization	3.65	1.26	0.93	0.48	0.49	–
4 Flourishing	4.45	0.77	0.93	0.45	0.74	0.79

All correlations were statistically significant ($p < 0.01$). Parameters for the correlation coefficients were considered as a small effect when $r \geq 0.10$, medium effect when $r \geq 0.30$, and large effect when $r \geq 0.50$ (Cohen, 1998).

intervals (CIs) (Hayes, 2017). We could demonstrate mediation in the event that zero did not lie within the range of values represented by the upper and lower CIs.

Results

Testing the measurement model

To evaluate the distinctness of the measured variables, four competing measurement models were tested by means of confirmatory factor analysis. The first model (Model 1) was configured as the theory proposes: authentic leadership was specified as a second-order latent variable, consisting of four first-order latent variables that were allowed to correlate, namely, self-awareness (three items), internal moral perspective (four items), balanced processing (four items), and relational transparency (three items). Trust in the organization (alternatively referred to as organizational trust) was measured by 11 directly observed items, and organizational support was measured by seven directly observed variables. Flourishing was also specified as a second-order latent variable, consisting of three first-order latent variables that were allowed to correlate, namely, emotional well-being (three items), psychological well-being (nine items), and social well-being (five items). The results indicated an acceptable fit to the data ($\chi^2 = 1826.53$, $df = 1111$, $p < 0.001$; CFI = 0.911; TLI = 0.906; RMSEA = 0.045, $p > 0.983$ [0.042,0.049]; SRMR = 0.055).

Three alternative models were specified. For Model 2, all factors were expressed similarly to those in the first model, except for authentic leadership, which was now specified as a single latent factor measured by 14 directly observed variables. Model 2 ($\chi^2 = 1840.20$, $df = 1115$, $p < 0.001$; CFI = 0.910; TLI = 0.905; RMSEA = 0.046, $p = 0.978$ [0.042,0.049]; SRMR = 0.055) offered an acceptable, yet slightly poorer, fit to the data compared to Model 1.

For Model 3, all factors were expressed similarly to those in Model 1, except for employee flourishing, which was now specified as a single latent factor measured by 17 directly observed variables. This model (Model 3) offered a clearly poorer fit to the data than the first two models.

We also tested a final competing measurement model (Model 4), where all constructs were measured by directly observed variables only. This model rendered the least acceptable fit to the data when compared to the first three alternatives. **Table 1** presents the fit statistics for the competing measurement models.

Comparison of the fit indices indicated that Model 1 fitted the data best and was also the model that was closest to what the theory proposes. The standardized regression coefficients were all statistically significant ($p < 0.01$), and all items loaded on their respective constructs as expected, with values ranging from 0.404 to 0.987. **Table 2** presents the correlation matrix for the latent variables, including their corresponding reliability coefficients.

The composite reliability of all the scales was above the cut-off point of.70. **Table 2**, furthermore, shows that all correlations were statistically significant. Correlations of large effect were recorded for the relationships between authentic leadership and organizational support, between organizational support and employee flourishing, and between trust in the organization and employee flourishing. Correlations approaching a large effect were recorded for the relationships between authentic leadership and trust in

TABLE 3 Standardized regression coefficients of authentic leadership, organizational support, and organizational trust, in predicting employee flourishing.

Variable	Estimate	SE	Estimate/SE	*p*
Flourishing as predicted by				
Authentic leadership	−0.46	0.043	−1.067	0.286
organizational support	0.580	0.041	14.300	0.000*
organizational trust	0.471	0.042	11.230	0.000*

$^*p < 0.01$.

the organization, between authentic leadership and employee flourishing, and between organizational support and trust in the organization.

Testing structural models

The structural model was tested based on the results of the ideal measurement model. The results indicated a good fit of the re-estimated model to the data: χ^2 = 1786.91, *df* = 1110, $p < 0.01$; RMSEA = 0.044 (90% CI:0.040,0.048); CFI = 0.916; TLI = 0.911; SRMR = 0.055. Although the chi-square test of model fit was statistically significant, the RMSEA and SRMR were below.08, and the TLI and CFI values were acceptable, with the results above the.90 criteria. **Table 3** shows the standardized coefficients estimated by Mplus for the structural model. From **Table 3**, it is evident that organizational support and trust in the organization positively and statistically significantly predicted employee flourishing. Hypothesis 1a and b were supported, but 1c could not be accepted.

Mediating effects

Due to the significant regression relationships from authentic leadership to organizational support and trust in the organization, respectively, as well as from organizational support and trust in the organization to employee flourishing, mediation analyses were performed to consider the roles of organizational support and trust in the organization as potential underlying mechanisms through which authentic leadership might indirectly affect employee flourishing.

Through the Hayes (2017) procedure, a serial multiple mediation model was tested. Employing 5000 bootstrap samples, bias-corrected 95% CIs were estimated. The unstandardized regression coefficients of the variables were used (Montoya and Hayes, 2017).

The mediation model simultaneously tested two alternative single-mediator pathways, as well as a two-mediator sequential pattern, to consider all possible alternative ways in which the predictor variables might influence employee flourishing. In addition, two demographic aspects – job category and employees' years of service in their current positions – were controlled for in each instance.

Firstly, the model tested whether the effect of an authentic leadership style on employee flourishing was mediated through the provisioning of organizational support alone. The indirect effect was significant (β = 0.2053, 95% CI = [0.1401 to.2760]), thereby indicating that organizational support served as an underlying mechanism through which an authentic leadership style promoted employee flourishing. Hypothesis 2 was accepted.

Secondly, the model tested whether the effect of an authentic leadership style on employee flourishing could be explained by trust in the organization as a facilitative mechanism, independent of the degree of organizational support provided to the employees. This indirect effect was also positive and statistically significant (β = 0.1813, 95% CI = [0.1177,0.2519]) and confirmed that an authentic leadership style would enhance employees' trust in the organization, which, in turn, would promote higher levels of employee flourishing at work. Hypothesis 3 was supported.

Finally, the indirect effect of the two-mediator sequential pattern was also significant, as indicated by the fact the 95% CI did not include zero (β = 0.0624, 95% CI = [0.0328,0.0994]). This finding was consistent with the hypothesis that organizational support enhanced employees' trust in the organization, which, in turn, was the more proximal predictor of employee flourishing. Hypothesis 4 was accepted.

Figure 1 below displays the full model, with unstandardized β weights for the path coefficients.

In summary, the data were consistent with the claim that authentic leadership had no direct effect on employee flourishing. Instead, authentic leadership had a substantial indirect, positive effect on employee flourishing through organizational support and trust, firstly, as underlying mechanisms that operated simultaneously, but independently of each other, as well as serially through organizational support, which enhanced trust in the organization, in turn promoting employee flourishing. The full model, including mediators and controlling for the covariates, accounted for 42% of the variance in employee flourishing.

Discussion

The job demands-resources (JDR) framework has established job resources as critical elements contributing to employees' wellness. According to Bakker and Demerouti (2017), a lack of resources can lead to a health impairment process, resulting in poor well-being. In contrast, organizational resources can lead to a motivational process with positive outcomes (Schaufeli and Taris, 2014). In this research in a manufacturing context, we investigated how authentic leadership, trust in the organization, and organizational support, as potential job resources, influenced employee well-being (outcome) during uncertainty (COVID-19).

While controlling for job category and years of service in the current position, our first findings indicated that all the correlations between constructs were statistically significant, while correlations of large effect were recorded for the relationships between authentic leadership and organizational support, between organizational support and trust, and between trust and employee flourishing. All the other correlations were of medium effect. Authentic leadership was seen as

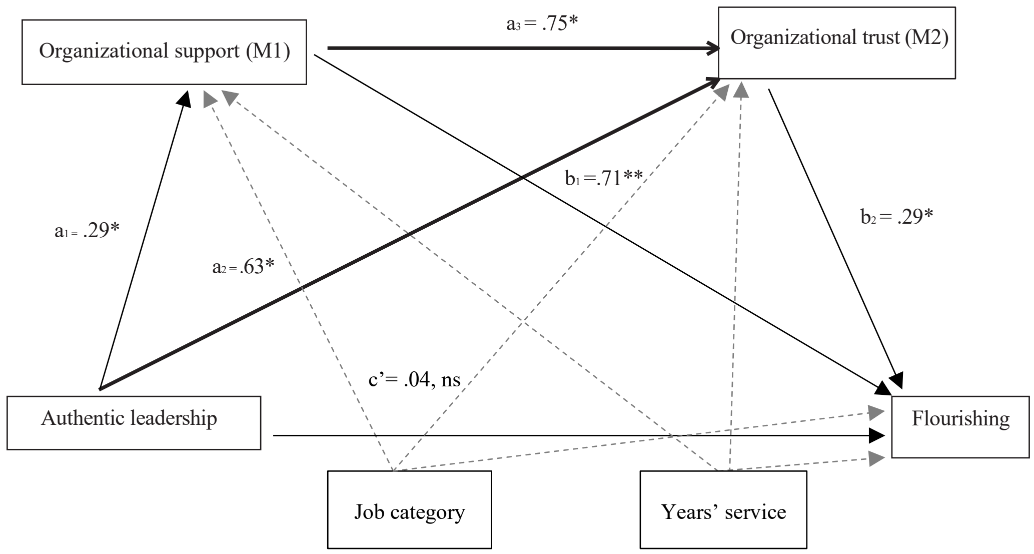

FIGURE 1
Two-mediator sequential model depicting the relationship between authentic leadership and flourishing as mediated by organizational support and trust, controlling for job category, and years' service in current position. Asterisks indicate significant coefficients (*$p < 0.05$).

a direct antecedent of organizational support. According to the literature, by being authentic, that is, being genuine and trustworthy, leaders establish constructive organizational conditions (Avolio and Gardner, 2005) and create trust (Gardner et al., 2005; Stander et al., 2015; Coxen et al., 2016). Employees who experienced their leader as authentic were likely to perceive the organization as supporting them. The positive relationship between organizational support and trust strengthens the conclusion reached by Zeng et al. (2020) that support as a resource generates positive emotions – in this study, trust – among employees. Additionally, Kleynhans et al. (2021a) mention that leaders who are open and allow employees to get to know them instill trust in the organization.

The positive relationship between organizational support and employee flourishing corroborates previous research (Kurtessis et al., 2017; Imran et al., 2020; Ho and Chan, 2022) and, at the same time, illustrates the importance of healthy work environments in uncertain times. In terms of the research context of this study, the particular manufacturing organization had been confronted with tough business challenges even before COVID-19. Having been exposed to support before could have softened the impact of the pandemic and strengthened employee trust in the organization. Employees could have trusted that the organization had demonstrated resilience in confronting business challenges in the past, while caring for its people. Therefore, they could have trusted that the same would happen in future.

Furthermore, from the results, it was evident that a strong relationship existed between authentic leadership, organizational support, trust in the organization, and employee flourishing. This supports organizations investing in interventions that will enhance trust and create psychologically safe environments where employees feel that the organization has their best interests at heart. These findings imply that leaders positively influence employees when they illustrate personal insight and active listening and consider employees' opinions and ideas, while being transparent in their interactions. Demonstrating these behaviors will create a feeling of psychological safety and promote trust in the organization. In this study, the support and trust led to a positive outcome: the flourishing of employees. This outcome is similar to previous research that established that authentic behavior had a profound influence on creating supportive workspaces and trust (Alkaabi, 2018; Malik et al., 2020), as well as the well-being of employees (Kernis, 2003; Ilies et al., 2005; Rautenbach and Rothmann, 2017b; Kerns, 2018; Agarwal, 2021; Nair et al., 2021), directly or indirectly. What makes these results more significant is that during times of COVID-19, leaders had less time to interact on a one-to-one basis or to demonstrate support and care. Having such a positive effect on employees in uncertain times reinforce the value of being an authentic leader. Without having empirical evidence, one may reason those authentic leaders possibly have an even more substantial influence on trust and feelings of support in uncertain times compared to normal circumstances. Chully et al. (2022) found that in a pandemic world, authentic leaders need to ensure that employees are comfortable sharing their opinions while the leaders support them and build a flexible and innovative culture that can endure the disruptive external environment. To sustain trust in circumstances such as a pandemic, leaders should remain closely connected to employees and demonstrate actions to enhance the strength of the authentic relationship (Ahern and Loh, 2020).

Significant regression relationships from authentic leadership to organizational support and trust in the organization, respectively, and from organizational support to employee flourishing were found. The direct effect of organizational support and trust in the organization on employee flourishing was positive and significant. Authentic leadership positively and statistically significantly predicted employee flourishing via organizational support and trust in the organization. In addition, from the results, it was evident that trust in the organization and organizational support significantly predicted employee flourishing. Being transparent and objective and behaving with integrity, authentic leaders contributed to developing healthy work environments with open, trustful relationships between the employees and the organization. The findings support Baran and Woznyj (2020) and Rath et al. (2021), postulating that employees depend on leaders for support and guidance. The present results, moreover, revealed that employees' experiences of organizational support contributed to trust in the organization. Ultimately, this positive experience of support and trust influenced employees' psychological, emotional, and social well-being and benefitted employees and the organization (Schotanus-Dijkstra et al., 2016). The results support Jaškevičiūtė (2021), who found that trust in the organization and trust in its leaders were positively associated with employee well-being.

Mediation analyses were performed to consider the roles of organizational support and trust in the organization as potential underlying mechanisms through which authentic leadership might indirectly affect employee flourishing. The study supports the mediating role that organizational support can play in the relationship between perceived authentic leadership and trust. This implies that, when individuals perceive their leaders as authentic, organizational support can be seen as a facilitative process that translates the perceived authenticity into a higher level of trust in the organization. This result is in line with the social exchange theory. Its basic principle is that relations are formed based on cost-benefit analysis, and people tend to duplicate behavior rewarded in the past (Blau, 1964). In this study, a good relationship between leaders and employees created a constructive climate, influencing the level of trust in the organization. It was then worth it for the employees to trust in the organization again in future (Dirks and Ferrin, 2001).

The results showed that trust played a mediating role in the relationship between organizational support and employee flourishing. Perceived organizational support improved trust in the organization, while trust strengthened the relationship between organizational support and employee flourishing. The results support the notion that trust plays a key role in enhancing employee wellness in uncertain times. Support and trust will enhance the experience of flourishing, and according to the literature, flourishing employees manage uncertainty better (Schotanus-Dijkstra et al., 2016). This result confirms the importance of protecting and maintaining the well-being of employees in challenging times (Deloitte, 2020) by practicing positive leadership, providing support, and enhancing trust in the organization.

Testing for serial mediation, authentic leadership positively and statistically significantly predicted employee flourishing via the directional impact of organizational support on trust in the organization. The level of trust will increase when employees perceive the organization as investing time and energy in meeting their needs, contributing to a higher level of trust in the organization. Organizational support on trust in the organization played a combined facilitating role, where authentic leadership indirectly predicted employee flourishing. Organizational support predicted trust in the organization. To be able to trust, employees needed evidence of previous positive experiences. Experiencing a healthy organizational climate, even in times of extreme demands, would, therefore, enhance employees' confidence in the organization, trusting that the organization would prioritize their needs and demands. Based on the principle of reciprocity, Sun (2019) mentions that how organizations treat their employees can influence perceived support, which, in turn, will have an impact on employee attitudes and behavior – in this case, trust.

This study provided empirical evidence that authentic leadership promoted employees' feelings that the organization supported them, while creating higher levels of trust in the organization. Employees' perceptions of their leaders' authenticity stimulated employee wellness through organizational support and trust in the organization. Previous research suggested that an uncertain, insecure work context harmed employee well-being (Standing, 2011; Utzet et al., 2020; Bakker and Van Wingerden, 2021). The findings in this study indicated that authentic leadership, organizational support, and trust in the organization could counterbalance the harm of uncertain work contexts.

These results are consistent with other research reporting that the role of leaders is imperative in challenging business environments (Baran and Woznyj, 2020; Rath et al., 2021). Wang et al. (2014) view authentic leadership as a positive approach that can be described as transparent, moral, and genuine, making a valuable contribution during precariousness. More specifically, leaders must create a positive work environment in which organizational support and trust in the organization are endorsed and encouraged. Employees who feel that the company offers opportunities for growth, development, and achievement will trust that the organization considers their needs and best interests, while treating them fairly. One can expect that such leadership behavior will influence employees' wellness and contribute to organizational outcomes such as performance, extra-role behavior, and the retention of high-potential employees.

Managerial implications

Some of the significant challenges facing organizations in the next few years are retention of talented people ("the great resignation"), being digital fit, managing ambiguity, fostering learning agility and change, and enhancing the wellness of their employees. In times of uncertainty and volatility, employees must trust their organization to implement initiatives that can possibly alleviate the negative effect of internal and external forces on the organization. Our results support the notion that organizational support and trust in the organization can be considered essential explanatory mechanisms in making it clear how positive perceptions of leadership may translate into employee flourishing in challenging times. This study confirmed that when employees experienced their leaders as being authentic, being self-aware, having a moral perspective, and displaying objectivity and transparency, would enhance feelings of trust and being supported by the organization. Ultimately, this would improve employee flourishing. From a JDR perspective, authentic leadership, organizational support, and trust in the organization are resources that should be nurtured to limit the influence of an imbalance between resources and demands, especially in times of uncertainty.

Organizations should invest time and energy in developing authentic leaders. Authentic leadership is a valuable resource that has an add-on effect: in this research, enhanced trust and experiences of support. One can assume that the only constant will be a continuous change in the future. The impact of change, uncertainty, complexity, and ambiguousness results in discomfort, adding a demand on the consumption of energy. Managers should focus on spending time with their people to get to know them, optimize their strengths, and create a psychologically safe environment by sharing information, being open, developing people, and showing concern for wellness. This support and care will inform employees that their leaders are genuinely concerned about them as human beings and not only as production factors. Support will lead to positive expectations regarding the leaders' intentions and the organization. When employees experience trust in the organization and its leaders, it will soften the impact of a demanding business environment, creating feelings of "being in this together".

Healthy positive relationships between employees and leaders will form the cornerstone of a positive work climate that is conducive to building trust and enhancing employees' wellness. Experiencing a positive organizational environment and trusting the intentions of the organization will strengthen employees' willingness to deal with challenges and cope with a volatile, uncertain, ambiguous, and complex business environment. Leaders must act as role models, authentically living their values. Leaders should accept that specific external threats are beyond their control. Still, leadership development and the creation of a trustful climate where employees feel safe to optimize their potential are within the control of the organization.

Contribution, limitations of the study, and recommendations for future studies

This study contributed to the theory by suggesting that authentic leadership directly created supportive working conditions and created trust. The positive association of authentic leadership with support and trust and the indirect effect on employee flourishing through the two variables mentioned highlighted the potential value of authentic leadership in the broader South African business context and, specifically, in the manufacturing industry. The findings of this study may also be extended to other industries that find themselves in an unstable business environment. This study attempted to add value by clarifying and providing understanding of the positive role of job resources in contributing to employees' wellness in times of exposure to hostile forces.

This research was not without limitations. Firstly, using a cross-sectional design did not allow investigation of the causal relationships between the variables. Secondly, the use of self-report information could have influenced the accuracy of results. Nevertheless, an effort was made to limit possible bias and ensure trustworthy responses. The respondents were assured that participation was voluntary and that they could withdraw at any time, that there were no right or wrong answers, and that the data would only be used in an aggregated format. A third limitation related to the sample. The study focused on only one company, and it might, thus, be interesting to determine whether the same results would be achieved in the industry or manufacturing in general. The current study focused on management levels within the manufacturing organization. Future studies could include all levels of employees. Similar future studies should consider a longitudinal approach to interrogate the relation between authentic leadership, trust in the organization, and employee flourishing over time to determine whether changes in the business context will affect the findings of this study. The vital role of organizational resources was highlighted in this research. The role of personal resources in times of uncertainty should be explored in the future. Currently, there is a qualitative and quantitative gap in research on the role of job resources compared to research on organizational or job aids. Exploring how the availability of personal resources might influence the way in which job resources and demands are experienced in challenging times could add value to the field of organizational psychology.

Conclusion

Based on our results and discussion, this study, thus, suggested that authentic leadership indirectly affected trust in the organization and feelings of support. Concurrently, the last two directly influenced employee flourishing. Employee wellness will be one of the most critical challenges for organizations and human capital practitioners in the next few years. The results indicated the value that leaders with insight, acting without personal biases, sharing information transparently, and building healthy relationships contributed to emotional wellness, with an expected positive impact on organizational health. From a JDR perspective, leadership, support, and trust in the organization resources ignited a motivational process that could counterbalance job demands in times of ambiguity. The results suggested that, despite operating in a turbulent context, endorsing an authentic leadership style could have beneficial individual consequences.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

This study involving human participants were reviewed and approved by the Economic and Management Sciences Research Ethics Committee (EMS-REC) of the North-West University, Potchefstroom, South Africa (ethics number: NWU-00609-20-A4). The participants provided their written informed consent to participate in this study.

Author contributions

MH and MS made contributions regarding the conceptualization, review, and editing of the study. MH performed the statistical analysis. All the authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Philanthropic sales in live-streaming shopping: The impact of online interaction on consumer impulse buying

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As philanthropic sales *via* live-streaming shopping have played an important role in alleviating the huge backlog of agricultural products during the outbreak of the COVID-19 pandemic, this paper aims to study how online interaction in philanthropic marketing exerts influence on consumer impulse buying behaviors. We empirically explore four major dimensions of online interactions in philanthropic live-streaming sales, i.e., the live streamers' image, the herd effect of consumers, the responsiveness of sellers, and the mutual trust between consumers. The results reveal that the herd effect of consumers and the responsiveness of sellers could promote consumers' empathy ability toward the growers of the products sold lively, whereas the live streamers' image and the mutual trust between consumers have little effect on empathy promotions. Meanwhile, both the consumers' empathy ability and the live streamers' image positively affect consumers' impulse buying behavior, which suggests a partial moderating role of consumers' empathy ability. Lastly, by taking both social and business perspectives, we provide managerial implications for improving the effectiveness and efficiency of philanthropic live-streaming sales to alleviate social and economic pressure in emergencies.

KEYWORDS

philanthropic marketing, live-streaming shopping, empathy, online interaction, impulse buying

Introduction

During the outbreak of the COVID-19 pandemic in early 2020, agricultural and sideline products from Hubei Province in China were in deep stagnation due to the severe pandemic impact on sales channels, which seriously reduced the income of local farmers and slowed down the economic development of society. To open up the sales channels to other areas outside Hubei critically affected by the pandemic and alleviate social and economic pressure, the philanthropic sales mode of the e-commerce platform has become the main sales mode to solve the backlog problem of local agricultural products. In 2021, China's live-streaming users have exceeded 635 million, wherein more than 38% watch philanthropic sales live and 27.8% watch agriculture-supporting sales live. With the rapid development of Internet surfing, live-streaming shopping has become a mainstream media channel for selling products. Given the unique characteristics, such as marketing innovation and real-time interaction, the live-streaming mode becomes easier to make consumers' immediate and unplanned purchases. Accordingly, philanthropic marketing can enhance the output of agricultural and sideline products in Hubei and other places and increase consumer purchases intuitively, instantly, and in bulk. The relevant data show that all kinds of popular live streamers such as local official media and local leading cadres have raised the daily sales of agricultural products from Hubei for philanthropic broadcast up to 52,000 with an increase of 360.2%, and the live e-commerce market size has increased 121.5% year-on-year with the output as high as 961 billion RMB. It is recognized that philanthropic sales can effectively boost consumers' willingness to purchase in live-streaming. However, due to the special nature of philanthropic behavior, what factors in live-streaming interaction will affect consumers' purchase behavior need to be further explored.

Studies have shown that impulse buying accounts for up to 70% of consumer purchase behaviors (Zeng, 2006). Piron (1991) believes that impulse buying is related to the emotions of individual consumers and is an immediate, unplanned purchase resulting from consumers' emotional responses to a specific stimulus. In the commercial context, scholars have studied impulse buying based on the mediating role of presence, from the perspective of the tripartite interaction between consumers and websites, consumers and online sellers, and consumers and consumers (Jiang et al., 2014; Chen et al., 2021). This is due to the fact that in a commercial environment, consumers pay for the hedonic experience, which is gained through in-person offline shopping and the pleasure of interacting with people in both directions. However, during the pandemic, the purchase motive of consumers participating in philanthropic live-streaming activities has changed, no longer principally to gain hedonistic experience but to help farmers in Hubei and other areas seriously affected by the pandemic to get rid of the stagnant sales plight of agricultural products. With increasing concern for the affected areas, and continuous perception of the urgent need for help, consumers' assistance intentions for farmers increased significantly, forming a sense of empathy. This empathic ability derives from the psychology of personal sorrow and empathic concern (Lai et al., 2021), but not from hedonic experiences. Therefore, the immersive stimulus created by online interactions in the traditional commercial live marketing model may no longer have a moderating effect on impulse buying behavior in philanthropic live-streaming. Thus, it remains to study whether online interactions affect the formation of consumers' empathy *via* philanthropic live-streaming, and then may have an impact on consumers' impulse buying. In philanthropic marketing *via* live-streaming, live streamers involve various types such as popular live streamers and stars, local official media, local leading cadres, etc. In particular, cross-border live-streaming combining live streamer and star has achieved good sales results. Therefore, this paper classifies the type of "live streamer + star" as flow live-streaming (celebrities with a huge fan base), whereas the type of "official media + local leading cadre" is as official live-streaming. Research has shown that popular live streamers are better at mobilizing consumers' active participation than stars, thus promoting consumers' purchasing behaviors (Fei and Zhou, 2021). Then whether the emerging type of live streamers spawned by the philanthropic live-marketing model in the pandemic context influences consumers' impulsive purchase behaviors has not been addressed in the current studies.

While the majority of live-streaming shopping research lay the focus on the sales of hedonic products in the commercial world, this paper innovatively explores the influence of online interaction on consumers' impulsive purchase behavior in philanthropic live-streaming sales, which is motivated by the real case of the stagnation of agricultural and sideline products in the context of the COVID-19 pandemic. This is because in such an emergency context, the mediating effect that online interaction has shown on consumers' impulsive purchasing behavior in philanthropic sales is typical and different, which worth further understanding. Moreover, to the best of our knowledge, the similarities and differences that how online interaction influences consumers' impulsive purchase behavior in commercial and philanthropic live-streaming models have not yet been compared and analyzed.

With this research using the Stimulus-Organism-Response (S-O-R) model, we characterize the online interaction in philanthropic live-streaming sales from four dimensions of stimuli, i.e., the live streamers' image, the responsiveness of sellers, the herd effect of consumers, and the mutual trust between consumers with dual perspectives of live streamer and consumer. We show the mediating role of empathy ability under the control of the live streamer type to explore the intrinsic influence mechanism of online interaction on consumers' impulse purchases. The partial moderating effects of consumers' empathy ability in both flow and official live-streaming modes have been compared and analyzed in detail. Based on our empirical results, we also provide management suggestions on how the philanthropic live-streaming sales model can promote consumer participation and enhance sales efficiency under the influence of emergencies, with the purpose of alleviating economic hardship.

Related literature

As this research looks at how online interaction in philanthropic live-streaming sales influences consumers' impulsive purchase behavior, the literature on online interaction, empathy theory, and impulse buying behavior is of relevance.

Online interaction

Interaction refers to the initiators' response to other participants. The term interaction encompasses several dimensions. From the perspective of existing studies, researchers have not yet reached a consensus on the division of the dimensions of interaction. Ku (1992) proposed six dimensions of interaction: immediate feedback, responsiveness, diversity of sources, communication links, equality of involvement, and ability to terminate. Zhao et al. (2014) divided the interaction into functional interaction, perceptual interaction, and process interaction. Xiong (2014) found that information quality interaction, network tool quality interaction, and service quality interaction together constitute online interaction. Dong et al. (2018) proposed four dimensions of online interaction based on a "storyline": online sensory interaction, online emotional interaction, online entertainment interaction, and online behavioral interaction. Zhou and Zuo (2012) explored online interaction between consumers from the perspective of virtual communities. Liu et al. (2012) found that in the online shopping context, online interactions also involve herding behavior. Some studies found that in the current era of the new economy, the personal charisma of the live streamer, the high level of interactivity, and the quality of the content will lead consumers to make impulsive purchases (Jiang, 2019; Lu et al., 2021). In Koufaris view, the interaction between the website and the online consumer could stimulate the consumer's interest in purchasing (Koufaris, 2002). In summary, online interaction can trigger impulse purchases, but how online interaction affects consumers' impulse purchases under the philanthropic live-marketing model needs further study. Since the perspective of interactive subject participation has not yet been refined, given the special nature of philanthropic live-marketing and the uniqueness of online platforms, the following will explore the influence of four factors on consumers' impulsive purchase intentions, namely, the live streamers' image, the herd effect of consumers, the responsiveness of sellers and the mutual trust between consumers.

Empathy theory

Empathy is the ability to perceive and understand the emotions of others with behavioral responses (Decety and Svetlova, 2012). Tucker (2016) explained empathy as an emotional ability to place the self in the situation of others. Some researchers argued the value of empathy marketing through emotional interaction, empathic interaction, and affinity interaction (Chen and Guo, 2021; Lin et al., 2021). Wang (2021) verified the effect of online microblogging interaction on social empathy. Some studies even pointed out that the combination of empathy theory and business models can better contribute to the growth of business value. Previous studies show that effective interaction increases the effect of empathy. In Hubei's special philanthropic live-streaming sales campaign, which assists the sales of agricultural products in Hubei during the pandemic, how the interaction between live streamers and consumers as well as between consumers and consumers affects the empathy of pro-social consumers is one of the focuses of this paper.

Impulse buying behavior

Impulse buying refers to unplanned and unconcerned regretful purchases from stimulating the audience users' instant desire to buy (Gao, 2018). There are many studies investigating the factors that influence impulse buying. Xiong and Jing (2010) constructed a model of the factors influencing consumer impulse buying in terms of marketing stimuli, context, and personal characteristics. He (2013) developed on this basis, and the study concluded that individual traits, marketing stimuli, situational factors, and other factors are influential on consumer impulse buying. Based on the perspective of individual traits: Zhao et al. (2015) segmented products based on involvement and emotional factors and then researched customers' impulse buying. Liu et al. (2017b) conducted a study corresponding to consumer emotions and impulse buying in terms of the visual appeal of the website pages to consumers and the ease of use of the website by customers. Based on the marketing stimulation perspective: Yin (2013) examined consumer impulse buying from an Internet promotional marketing perspective. Zhang and Li (2017) explored the intensity of consumer impulse buying from the perspective of different time-limited pressure and promotional offers. From the context perspective: Zhao et al. (2014) explored the reasons for stimulating consumers' impulsive purchases from an online product display perspective. Zhu et al. (2017) found that two important factors influencing consumers' impulse purchases were the quality of online user reviews and the reviewer's rank. Hu (2015) has conducted a corresponding study based on the social interaction of views and behaviors. However, the underlying mechanism that drives consumers to perform impulse purchases in philanthropic live-streaming shopping waits for further empirical evidence.

Materials and methods

Theoretical model

Previous studies have shown that online interaction affects consumer impulse buying. Based on the S (stimulus)-O (organism)-R (response) model, as shown in Figure 1, this paper takes live-streaming interaction in Taobao philanthropic sales as an external stimulus, the empathy effect generated by consumers as a mediating variable and the type of live streamer as a control variable, and finally the consumer impulsive purchase as a behavioral response. We then comprehensively explore the influence mechanism of online interactions on consumers' impulsive purchases.

Research hypotheses

Online interaction and empathy effect

There are very limited studies focusing on online interaction and empathy effect in live-streaming shopping, only Tan et al. (2020) pointed out that in interpersonal interaction, individual

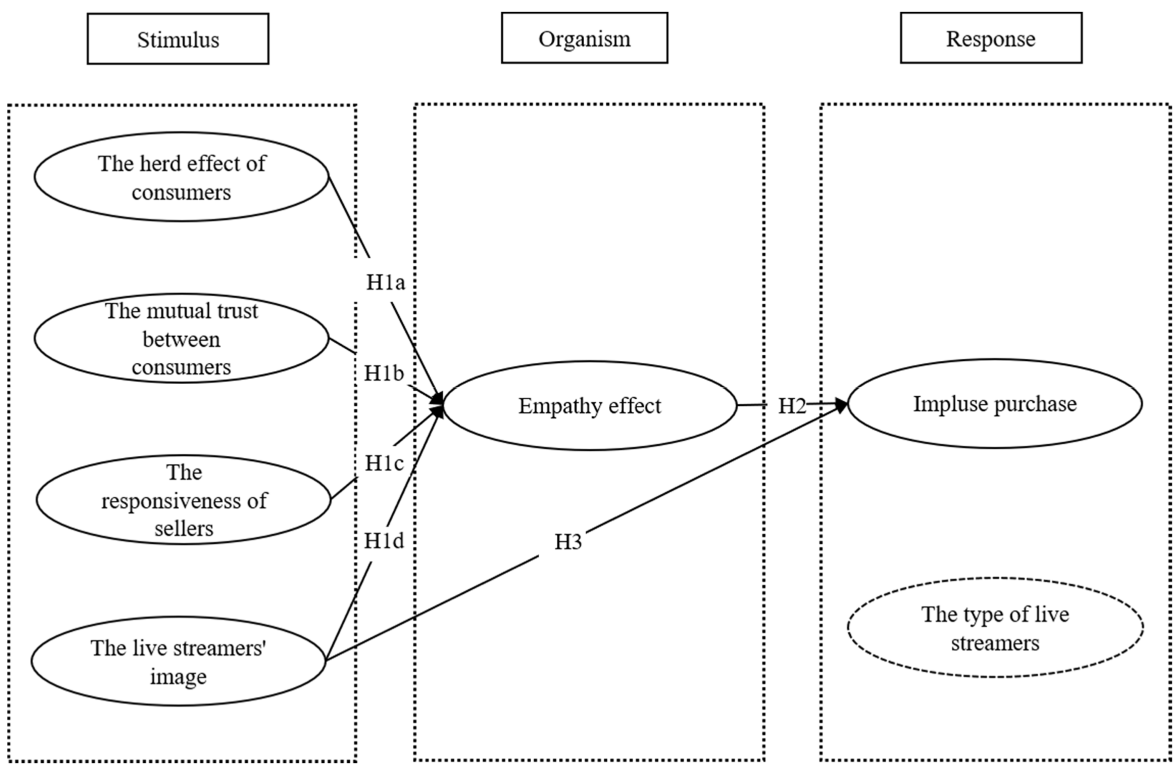

FIGURE 1
The theoretical model.

recognition and perception of others' information will affect their emotional resonance. With the desire to provide assistance to the affected population and alleviate the economic hardship caused by the pandemic, the more intensive the interactions between consumers, live streamers, and other consumers are, the more likely the emotional resonance will produce. Therefore, this study puts forward the following hypotheses on the relationship between online interaction and consumer empathy effect under philanthropic live-streaming:

> *H1*: Online interaction in live shopping positively correlates with the empathy effect of consumers.

We divide online interaction into four variables:

- The interaction between live streamers and consumers
- The effect of live streamers and responsiveness
- Interaction between consumers
- The herd effect of consumers and the mutual trust between consumers

Liu et al. (2017a) believe that individual users with social preferences are willing to share their consumption experiences on social networks. Moreover, some researchers point out that online reviews about products could influence consumers' purchasing behavior (Zhao et al., 2020; Li et al., 2022). However, merchants often increase their business profits by adding comments that confuse the real experience of the commodities (Ding and Yu, 2022). Therefore, the following hypotheses are made:

> *H1a*: The herd effect of online interaction is positively correlated with the formation of the consumer empathy effect.
>
> *H1b*: The mutual trust of online interaction is negatively correlated with the formation of the consumer empathy effect.
>
> *H1c*: The responsiveness of online interaction is positively correlated with the formation of the consumer empathy effect.
>
> *H1d*: The online interaction effect of streamers is positively correlated with the formation of the consumer empathy effect.

Empathy effect and impulse buying

Many scholars have found that they have a positive relationship in the study of the empathy effect and consumer purchase (Chen et al., 2022; Jing et al., 2022). Nevertheless, in the public broadcast mode, whether consumer impulse purchase will be positively affected by the empathy effect remains to be studied. Therefore, this study proposes the following hypothesis:

TABLE 1 Measurement items and variable explanations.

Item	Description
Live streamers' image F1	①When shopping *via* philanthropic live-streaming, I think the streamers I follow have extraordinary personalities.
	②When shopping *via* philanthropic live-streaming, I think the streamer has a wealth of information about the products for sale.
	③When shopping *via* philanthropic live-streaming, the products recommended by the streamer give me the desire to buy.
Responsiveness of sellers F2	①When shopping *via* philanthropic live-streaming, the streamer can respond to my questions on time.
	②When shopping *via* philanthropic live-streaming, the streamer's response is closely related to my question.
	③When shopping *via* philanthropic live-streaming, the streamer is very happy to communicate with me.
Herd effect of consumers F3	①I shop *via* philanthropic live-streaming because I see my friends buying.
	②When shopping *via* philanthropic live-streaming, I like to buy products that have the most visitors or are praised by people.
	③When shopping *via* philanthropic live-streaming, the more buyers of the product, the more I want to buy.
Mutual trust between consumers F4	①When shopping *via* philanthropic live-streaming, I think the buyer's comments are mostly spurious to confuse the authenticity of the use of the goods.
	②When shopping *via* philanthropic live-streaming, I think the buyer's goods are shared not to optimize my purchase but for the merchant's profitable marketing purposes.
	③When it comes to philanthropic live-streaming shopping, I think a 5% lousy review is more convincing than a 95% decent review.
Consumers' empathy ability F5	①When shopping *via* philanthropic live-streaming, I think the live site will make me feel the depression under the Hubei pandemic.
	②When shopping *via* philanthropic live streaming, I think the live bullet comments will remind me of a similar experience.
	③When shopping *via* philanthropic live-streaming, I think I would think about the state of the pandemic in Hubei.
	④When shopping *via* philanthropic live-streaming, Slogans such as "I am three pounds fatter for Hubei" can make me feel enthusiastic.
Consumers' impulse buying behaviors F6	①When shopping *via* the philanthropic live-streaming, I will find something that is not in the plan but I want to buy.
	②When shopping *via* the philanthropic live-streaming, I will buy some products that I did not intend to buy.
	③When shopping *via* the philanthropic live-streaming, I will buy without thinking.

> *H2*: The formation of the consumer empathy effect positively correlates with consumer impulse buying.

Live streamers' image and impulse buying

Previous studies have shown that "celebrity" attraction positively affects consumers' purchases (Liu et al., 2020), while current live streamers with millions of fans have been given a "celebrity" halo. Therefore, this study puts forward the following hypothesis for the live streamers' effect and consumer impulse buying:

> *H3*: The effect of live streamers is positively correlated with consumer impulse buying.

Research design

Questionnaire

As the proportion of live users using the Taobao live-streaming platform (i.e., the largest online C2C e-commerce platform in China) is as high as 68.5%, this study targets Taobao live-streaming users in the design of the questionnaire. Regarding the measurement of independent variables such as responsiveness, mutual trust, live streamers' effect, and herding effect of online interaction, we refer to the scales introduced by Wu (2006), Tang (2007), Song and Zinkhan (2008), Zhang (2009) and Liu et al. (2012). Similar to Vijayasarathy (2002) and Jing and Yue (2005) survey on impulse buying, Yuan (2011) measurement of impulse buying intention, Davis (1983) measurement of the empathy effect, we form the final measurement scale (Table 1) with modest modifications based on the previous research scales, which also combines the characteristics of charitable live-streaming shopping during the COVID-19 pandemic.

Research method

This study employs AMOS 24 and SPSS 25 software to test and analyze the proposed model and hypotheses using structural equation modeling (SEM). Two main components of models are distinguished in SEM: the measurement model showing the relations between latent variables and their indicators, and the structural model describing potential causal dependencies between endogenous and exogenous variables.

Specifically, the equation of the measurement model is characterized as:

$$x = \Lambda_x \xi + \varepsilon$$

$$y = \Lambda_y \eta + \sigma.$$

In our research, x is a 12×1 vector of the observations for 4 exogenous latent variables consisting of attitude toward the live streamers' image, the herd effect of consumers, the responsiveness of sellers, and the mutual trust between consumers, while y is a 7×1 vector that observes 2 endogenous latent variables, i.e.,

TABLE 2 Demographic description.

Demographic characteristics	Classification	Frequency	Percentage (%)
Gender	Male	208	44.92
	Female	255	55.08
Age	<25	43	9.29
	25 ~ 30	126	27.21
	31 ~ 35	179	38.66
	36 ~ 40	93	20.09
	≥40	22	4.75
Educational level	High school education and below	27	5.83
	Vocational College Degree	52	11.23
	Bachelor degree	320	69.11
	Master degree	58	12.53
	Doctor degree and above	6	1.30
Salary (CNY/Month)	<2000	67	14.47
	2001 ~ 4,000	92	19.87
	4,001 ~ 6,000	131	28.29
	6,001 ~ 8,000	107	23.11
	8,001 ~ 10,000	58	12.53
	≥10,000	8	1.73

consumers' empathy ability and consumers' impulse buying behaviors. In terms of the exogenous latent variables, ξ is a 4×1 vector and η is a 2×1 vector. Λ_x refers to the 12×4 factor loading matrix of x on ξ, Λ_y refers to the 7×2 factor loading matrix of y on η, and ε and σ denote the error terms of the exogenous and endogenous variables, which cannot be explained by the latent variables.

Then, the equation of the structural model is expressed as:

$$\eta = B\eta + \Gamma\xi + \lambda.$$

B is a 2×2 coefficient matrix of the interaction between endogenous latent variables, Γ is a 2×4 coefficient matrix that shows the influence of exogenous latent variables on endogenous latent variables, η and ξ refer to the vectors given by the measurement model, and λ shows the unexplained part of the model, such as confounding factors or residuals.

Empirical findings

Descriptive statistics

We target experienced consumers in Taobao philanthropic live-streaming purchases. Before the formal release of the questionnaire, a pre-survey was conducted to test the reliability and validity of the questionnaire design. The sample data of the questionnaire were collected through sharing links on social media as well as the professional questionnaire market. A total of 537 questionnaires were distributed with 496 pieces finally collected. The feedback of 33 of the respondents was excluded because they did not use Taobao live-streaming during the COVID-19 pandemic. Finally, 463 valid questionnaires were used for this research. The collection rate of valid questionnaires is 86%, which meets the requirement of a valid sample five times the measurement items. The results of demographic characteristics are shown in Table 2.

Amongst the valid questionnaires, male respondents take a proportion of 44.92% and females take 55.08%, with a relatively balanced gender structure. Regarding the age structure, 9.29% are under 24 years old, 27.21% are between 25 and 30 years old, 38.66% are between 31 and 35 years old, 20.09% are between 36 and 40 years old, and 4.75% are over 40 years old. The sample population structure is consistent with that of Freshippo and Missfresh, which is reasonable. In terms of educational background, the proportion with a bachelor's degree or above accounts for 82.94%, and others accounts for 17.06%. As for the income structure, over 51.4% of the respondents earn a salary between 4,000–8,000 RMB a month. The statistical characteristics of the sample population are consistent with the demographic characteristics of the industry analysis report for Chinese fresh e-commerce released in 2022 (iiMedia Report, 2022).

Reliability and validity

In this research, reliability is tested by Cronbach'α. When Cronbach'α is less than 0.5, the reliability is poor; between 0.5 and 0.7, the reliability is normal. The reliability is good when Cronbach'α is between 0.7 and 0.9 and great when it is over 0.9. As can be seen from Table 3, the reliability of the entire questionnaire is 0.842 with the Cronbach'α coefficients of 6 latent variables all higher than 0.7. Therefore, the reliability of each scale suggests that the questionnaire design is reasonable.

TABLE 3 Results of reliability and validity analysis.

latent variable	Item	Factor load	Cronbach'α	KMO	CR	AVE
F1	Ab1	0.761	0.736	0.664	0.746	0.496
	Ab2	0.617				
	Ab3	0.727				
F2	Re1	0.823	0.833	0.714	0.835	0.629
	Re2	0.734				
	Re3	0.819				
F3	En1	0.681	0.764	0.676	0.774	0.534
	En2	0.806				
	En3	0.699				
F4	He1	0.833	0.793	0.691	0.800	0.573
	He2	0.777				
	He3	0.649				
F5	Em1	0.583	0.777	0.768	0.784	0.480
	Em2	0.766				
	Em3	0.773				
	Em4	0.629				
F6	Bu1	0.724	0.723	0.655	0.740	0.491
	Bu2	0.776				
	Bu3	0.587				

TABLE 4 Discriminant validity: Pearson correlation vs. AVE square root value.

	Factor1	Factor2	Factor3	Factor4	Factor5	Factor6
Factor1	**0.704**					
Factor2	0.641	**0.793**				
Factor3	0.574	0.446	**0.731**			
Factor4	−0.154	−0.188	−0.056	**0.757**		
Factor5	0.502	0.452	0.536	−0.044	**0.693**	
Factor6	0.471	0.317	0.485	−0.041	0.402	**0.700**

Diagonal numbers are AVE square root values.

The validity of the sample data is tested using KMO (Kaiser-Meyer-Olkin) and Bartlett coefficients, factor load, CR (combined reliability), and AVE (mean–variance extraction). Table 3 shows that the KMO value of the entire questionnaire is 0.882, wherein the KMO values of 6 latent variables are all over 0.6, suggesting that the measurement scale is suitable for factor analysis. The exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) show that the factor load of each measurement item is more significant than 0.5, the AVE is more significant than 0.4, and the CR is more significant than 0.7, indicating that the measurement variables have good convergence validity and internal consistency.

Because this study adopts the questionnaire survey method, the Harman single factor test method is used to test the homologous variance of data to prevent homologous variance. The results show that the maximum factor variance interpretation rate is 33.448%, less than 40%. Moreover, as demonstrated in Table 4, the square root value of AVE for each factor is greater than the absolute value of the correlation coefficient between the elements, implying good discriminant validity. Therefore, this study has no common method deviation, and data analysis can be carried out.

Model analysis

Structural equation modeling was selected as the test method to test this study's research framework and hypotheses. Firstly, the total speculative hypothesis model is tested. Secondly, theoretical assumptions that do not pass are excluded. Finally, the control variable, i.e., the live streamers' type, is introduced to analyze how online interaction affects consumer impulse buying mediated by empathy and how the live streamer effect affects consumer impulse buying. In this paper, Amos24.0 software is used for model fitting analysis. As shown in Table 5, the initial model fitting indexes all reach the standard values, and the model fitting effect is good. The hypothesis test results are shown in Table 6.

It can be seen from Figure 2 and Table 6 that H1b and H1d are not valid. After eliminating the relationship, Amos software is

TABLE 5 Initial model fit test.

	χ^2	*df*	χ^2/df	AGFI	NFI	IFI	CFI	RMSEA	SRMR
Standard			<3	>0.9	>0.9	>0.9	>0.9	<0.06	<0.05
Result	346.390	140	2.474	0.899	0.905	0.941	0.941	0.056	0.0514

TABLE 6 Initial hypothesis test.

Hypothesis	Estimate	P	Result
H1a	0.443	***	√
H1b	0.052	0.278	
H1c	0.217	0.018	√
H1d	0.166	0.260	
H2	0.182	0.026	√
H3	0.501	***	√

***$p < 0.001$.

used to re-fit the model. The fitting results of the modified model are shown in Table 7.

From the modified fitting of the model, χ^2/df is 2.422, AGFI is 0.916, NFI, IFI, and CFI are 0.924, 0.954, and 0954, respectively, RMSEA is 0.055, and SRMR is 0.0433, satisfying the optimal index of model fitting. Table 8 shows the path test after adding control variables. In this model, the live-streamer variables are divided into two categories with corresponding data included. Consequently, the model is fitted.

After adding the live-streamer type as a control variable, the model fitting test results are shown in Table 8, wherein the hypothesis tests of the modified model are significant. The number of valid samples for flow live-streaming viewers is 267, with significant corresponding hypothesis tests except for H2. Whereas the number of official live-streaming viewers is 196, and the corresponding hypothesis tests are significant.

Results of hypothesis testing

From Table 6 and Table 8, we can see that H1a and H1c are tested with significance, while H1b and H1d are not significant in the hypothesis that online interaction *via* live-streaming shopping is positively correlated with consumer empathy. The results show that the herd effect and responsiveness of online interaction can largely enhance consumers' empathy, whereas the effects of mutual assistance and streamers' image are not significant, which is different from the counterpart results of commercial studies (Jiang et al., 2014).

The findings also show that H2 is not that significant for live-streaming models, indicating that the influence of empathy on consumer impulse buying depends on the type of live streamers. On the other hand, the test of Hypothesis H3 suggests that the streamers' image is positively correlated with consumer impulse buying.

In summary, the empathy effect acts the role of a partial mediator between online interaction and impulse buying. While adding the live-streamer type as a control variable, the influence of herd effect and responsiveness on empathy effect is greater in official live-streaming than in flow live-streaming. Specifically, the empathy effect of consumers using official live-streaming significantly enhances their impulse buying, whereas the empathy effect *via* flow live-streaming has a very slight impact on consumers' impulse buying. But inversely, the impact of the live streamers' image on consumer impulse buying is weaker when using official live-streaming than using flow live-streaming.

Discussion and conclusion

Summary of empirical findings

Based on the S-O-R model, this paper has investigated the impact of the live streamers' image, the responsiveness of sellers, the herd effect of consumers, and the mutual trust amongst consumers on impulse purchases from the dual perspective of live streamers and consumers. We introduce the empathy effect as a mediating variable and the live streamer type as a control variable to explore the underlying mechanism of online interaction's influence on consumers' impulse purchases in philanthropic live-streaming marketing. The main findings of the study are listed as follows:

(1) The formation of consumer empathy influences consumers' impulse purchases positively and significantly. Specifically, the responsiveness of sellers and the herd effect of consumers indirectly influence consumers' impulse purchases through the empathy effect while mutuality does not affect the formation of the consumer empathy and impulse purchase. On the other hand, the live streamers' image directly affects consumers' impulse purchases. Under the control of live streamers' type, the herd effect and the responsiveness produced by the official live-streaming on empathy is more significant than that by flow live-streaming.

(2) The formation of consumer empathy is positively correlated with impulse buying behaviors, that is, the higher empathy the consumer shares, the greater the chance consumer would purchase impulsively. Impulse buying is an immediate, unplanned purchase behavior of consumers induced by an emotional response to external stimuli, so emotional stimuli play a crucial role in impulse buying behavior. In the context of the pandemic, the philanthropic live-streaming was led by the "Thanks for helping Hubei" campaign with the primary purpose

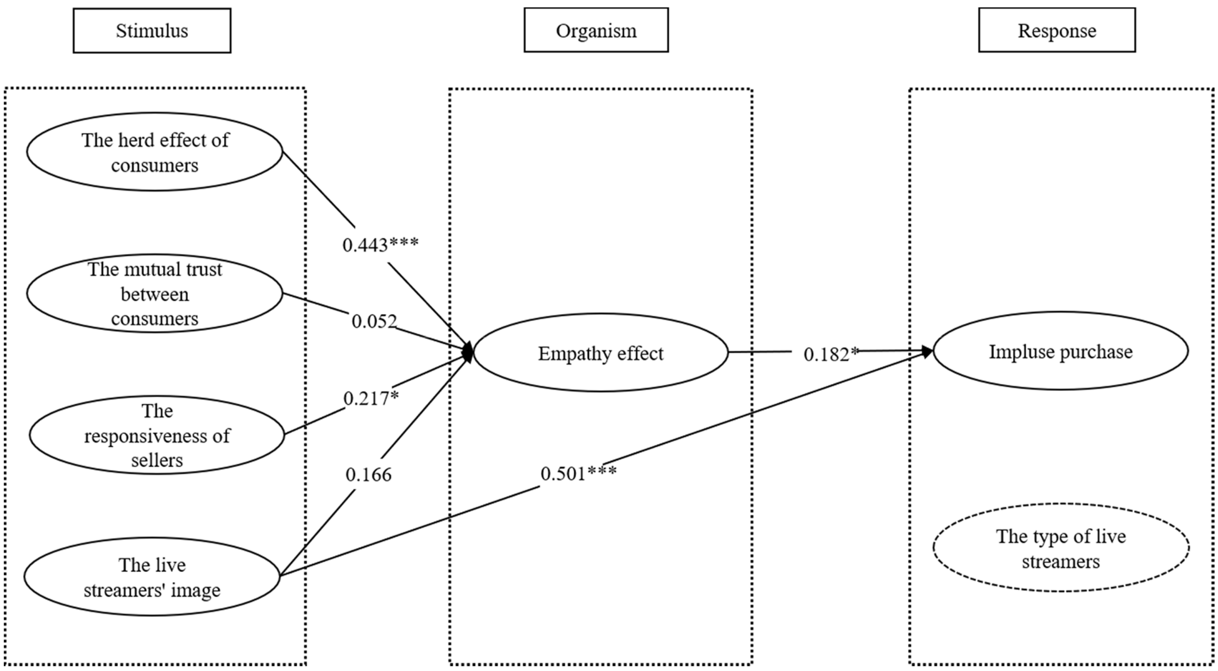

FIGURE 2
Path coefficient test.

TABLE 7 Modified model fit test.

	χ^2	df	χ^2 / df	AGFI	NFI	IFI	CFI	RMSEA	SRMR
Standard			<3	>0.9	>0.9	>0.9	>0.9	<0.06	<0.05
Result	232.537	96	2.422	0.916	0.924	0.954	0.954	0.055	0.0433

TABLE 8 Modified model hypothesis test.

Hypothesis	Model after correction		Type1(N = 267)		Type2(N = 196)	
	Estimate	P	Estimate	P	Estimate	P
H1c	0.278	***	0.247	**	0.289	**
H1a	0.546	***	0.520	***	0.604	***
H2	0.229	**	0.085	0.383	0.353	**
H3	0.511	***	0.610	***	0.324	*

*$p < 0.05$; **$p < 0.01$; ***$p < 0.001$.
Type1 refers to the flow live-streaming with a huge fan base; Type2 refers to the official live-streaming with government officers.

of appealing across the country to purchase agricultural and sideline products stagnantly sold in Hubei, as well as to reduce the negative impact of the pandemic on the local economy. The charitable contributions of live-streaming shopping make consumers feel that they can help the affected people, which encourages consumers' pro-social preferences and the psychological satisfaction of buying. Thus, the empathy feeling that consumers generate through real-time online interactions with live streamers and other consumers is the central emotional stimulus influencing consumers' impulsive purchasing behavior.

(3) The responsiveness of sellers and the herd effect of consumers have a strong positive effect on empathy. Consistent with the measurement of the herd effect, which revolves around consumer-to-consumer interaction, a leading slogan such as "Put on weight for Hubei" has achieved the consistency of group opinions that is conducive to raising empathy feelings among groups. On the other hand, the measurement of responsiveness, referring to the interaction between live streamers and consumers using bullet comments, also revolves around issues such as the impact of the pandemic, the need for assistance, product quality,

and price. This study shows that intuitive, real-time, targeted, and repetitive feedback will create a sense of responsibility among consumers, which prompts the perception of the recipient's urgent needs with emotional resonance for supporting agricultural consumption.

(4) The mutual trust between consumers has no significant impact on the empathy effect. Mutual trust between consumers improves the authenticity evaluation of products and purchasing behaviors through the bullet comments in live-streaming. However, this paper shows a weak correlation between mutual trust and empathy, that is, consumer interactions from real-time comments do not affect consumers' empathic perceptions. This conclusion contradicts the findings from commercial live-streaming shopping. This is particularly because in philanthropic live-streaming, assisting the affected population due to the outbreak of the pandemic is the primary goal of consumers' participating in the campaigns. Although effective interpersonal interactions can indeed enhance consumer impulse purchases as real-time online comments from consumers can improve the perception and understanding of the actual utility of the products and services and allow consumers to feel like being in a community with warmth, the characteristics of the products (e.g., quality and price fairness) and merchant services (e.g., logistics and after-sales services) are no longer the primary concerns of consumers in the context of philanthropic marketing.

(5) The live streamers' image positively influences consumers' impulse buying behaviors but has no significance on the empathy effect of consumers. That means the personal charisma of streamers can directly affect consumers' impulse buying behaviors without the need to empathize with them. Similar to the celebrity effect, consumers become loyal fans of the streamer during their long-term participation in the live streaming, laying the foundation of the consumer base of the streamer. For instance, Jiaqi Li, a grassroots streamer popular on social media, who is good at product recommendations, has a powerful influence and outstanding consumption conversion rate in live-streaming shopping. Thus, during the COVID-19 pandemic, the streamer's active participation in philanthropic sales activities can make consumers feel positive toward the streamer's personality and result in impulsive purchases.

(6) The herd effect of consumers and the responsiveness of sellers have a stronger influence on the empathy effect through official live-streaming than the flow live-streaming. In the context of emergencies, the spirit of leadership is more authoritative and unified in opinion. For example, in the official live-streaming, real-time feedback from local leaders and cadres allows consumers to quickly understand the severity and urgency of the situation, thereby enabling consumers to form empathetic feelings. Whereas in the flow live-streaming mode, the image of live streamers can directly affect consumers' impulse buying behaviors without the mediating role of empathy. The "streamer+ star" type results in the same outcomes as celebrities, suggesting a better philanthropic live-streaming effect by effectively encouraging the participation of fans.

Different from the majority of existing empirical research on consumer impulse buying behaviors in commercial live-streaming shopping, this paper explores the influence mechanism of online interaction on consumers' impulse purchases in the philanthropic live-streaming model, which is based on the real case at the outbreak of the COVID-19 pandemic. We also analyze the similarities and differences of how online interaction may influence consumer impulse purchases in both commercial and philanthropic live streaming models. Therefore, on the one hand, this study enriches the empirical analysis of consumer impulse buying behavior in different live-streaming sales contexts. On the other hand, it explores how philanthropic live marketing can promote consumers' participation in the campaign and enhance sales efficiency under emergencies to alleviate economic hardship.

Management implications

According to the theoretical conclusions, we further put forward management suggestions on how the philanthropic live marketing model can enhance sales efficiency and alleviate economic hardship under the influence of emergency events from both social and business perspectives.

(1) From the social perspective, the live streamers' charitable credibility is key to promoting philanthropic live-streaming marketing as the improvement of consumers' empathy ability and live streamers' images increase consumer impulse buying. In the face of socio-economic problems such as the stagnant sales of agricultural and sideline products, consumers' active participation in philanthropic live-streaming sales may largely alleviate the sharp decline in farmers' income affected by the pandemic. Therefore, it becomes very important to invite streamers with a high charitable reputation to increase the participation intentions of consumers in the campaigns (Monfort et al., 2021; Gao et al., 2022). Streamers and platforms with prior philanthropic behaviors will more likely convince consumers that the current philanthropic sales are credible routines that resonate better with consumers. Therefore, philanthropic live-streaming merchants and resident streamers should normalize their philanthropic behaviors, not only in emergencies such as natural disasters or major public health events but also in regular aid for people with disabilities, children in poverty, and other charitable activities to accumulate credibility and further enhance the influence of streamers.

(2) From the business perspective, philanthropic live streamers should strengthen their effective interactions with consumers. This research shows that an increase in the responsiveness of the sellers is followed by an increase in the empathy effect of consumers, which leads to an increase in active engagement and, in turn, an increase in consumer purchase behaviors. Thus, improving the response efficiency to solve consumers' questions and strengthening the interactions between buyers and sellers can effectively promote consumers' purchasing behaviors. Especially, sellers should pay attention to the change in streamer type. As online interaction under official live-streaming

can better stimulate the empathy effect of consumers, it is necessary to use a cross-border live-streaming mode, which combines local government officials with traditional streamers, to enhance sales efficiency and produce greater business value through philanthropic live-streaming marketing.

From the perspective of consumers, it is vital to choose a reputational platform for information exchanges since the herd effect of consumers can positively influence consumers' empathy and thus positively influence their impulse buying behaviors. It is recommended that platform managers should publicize the mission, goal, and vision of philanthropic live-streaming and create a real and comfortable platform environment for consumer-to-consumer interconnection and purchase information sharing.

Research limitations

Because of the limitations of objective conditions and research capabilities, there are still some shortcomings in this study, which are mainly manifested in the following three points:

(1) The selection of survey samples has limitations. This limitation is mainly reflected in the lack of universality in the selection of sample platforms. This paper mainly uses Taobao live-streaming as an example to conduct research. However, in addition to Taobao, there are live broadcast platforms such as TikTok and JD.COM.

(2) The limitation of research model design. The selection of variables is mainly through literature research, live user interviews, and other ways to summarize the main influencing factors. There is still room for discussion. Whether online interaction will affect consumers' impulse buying by influencing consumers' trust and whether consumer trust will affect the formation of the empathy effect remain to be studied.

(3) Limitations of research scenarios. This article mainly carries on the questionnaire survey through the scene pattern. The respondents can only fill in the questionnaire by recalling and associating their Taobao philanthropic live-streaming shopping scene, which may be different from their real purchase situation. For example, the respondents' emotions at the time of filling in the questionnaire, their quality of memory, and other factors will influence the objectivity of the collected data.

In future research, it is necessary to expand the survey sample further, research consumer groups in different platforms and regions, and conduct a deeper analysis of the online interaction dimension to explore whether there are more influencing factors under the online interaction dimension that will have an impact on consumer impulse buying.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

YY: conceptualization, methodology, data analysis, writing—review and editing, and funding acquisition. ZZ: data collection, data analysis, software, and writing—original draft preparation. HD: software and validation. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Role of agile leadership in managing inter-role conflicts for a satisfying job and life during COVID-19 in a VUCA world

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This study investigated how agile leadership played its role in managing inter-role conflicts during the chaotic period of the COVID-19 pandemic. The COVID-19 pandemic was much more than the survival of the fittest and coming out of it alive. Organizations were under immense pressure to resume their normal operations in not-so-normal situations. This period of turmoil and agony brought a broad array of inter-role conflicts, which posed challenges for leaders to manage them effectively. The satisfaction at job and the satisfaction in life were the two most important endeavors for the employees to fight. This study explores how leadership agility helped employees manage their work–family and family–work conflicts, consequently impacting life satisfaction and job satisfaction simultaneously. Moreover, role ambiguity, role conflict, and role overload are important intervening role stress factors that impact inter-role conflict management. So, role stress is a moderating factor in the direct relationship between agile leadership and inter-role conflict. This is a two-phased time lag study with a quantitative design for data collection. The first phase of data collection comprises of analyzing the impact of agile leadership on inter-role conflict management, keeping in view the intervening impact of role stress. The second data collection phase examines how inter-role conflicts impacted life satisfaction and job satisfaction during COVID-19. The data were collected from faculty working in higher education institutions in Pakistan, as the education industry was the second major sector that was affected because of COVID-19 after the health care industry. This research found that agile leadership plays a significant role in determining job satisfaction and life satisfaction. Agile leadership during the COVID-19 pandemic helped to manage work–family (AgileL -> WFC -> JS β = 0.1020, p = 0.0112 and AgileL -> WFC -> LS β = 0.1361, p = 0.0014) and family–work conflicts (AgileL -> FWC -> JS β = 0.1598, p = 0.0017 and AgileL -> FWC -> LS β = 0.1160, p = 0.0093) and reduce role stress. Future researchers might include marital satisfaction, as the inter-role conflicts highly impacted marital satisfaction and resultant imbalances among dual-earning couples. Comparative studies in this regard, explaining how dual-earning couples managed to sustain marital health and the role of leadership in developed and developing countries would be enlightening.

KEYWORDS

COVID-19, agile leadership, role stress, work–family conflicts, family–work conflicts, life satisfaction, job satisfaction

Introduction

The corporate world is currently dealing with a very volatile, uncertain, complex, and ambiguous scenario, referred to as a volatile, uncertain, complex and ambiguous (VUCA) world (Setiawati, 2021). The COVID-19 pandemic has wreaked havoc on education systems worldwide, affecting approximately 1.6 billion students in over 200 nations. More than 94% of the world's student population has been affected by the closure of schools, institutions, and other learning facilities (Zheng et al., 2022). The pandemic has affected the faculty in these educational institutes as much as it has affected students worldwide, resulting in significant changes in every part of personal and professional lives (Pokhrel and Chhetri, 2021; Zheng et al., 2022). As many "new normal" emerged (Zacher and Rudolph, 2021), a pandora box of new challenges for employees in terms of change adaption, job satisfaction, and a significant impact on employee well-being and happiness is unlocked (Nemteanu et al., 2021; Antino et al., 2022). The impacts of the COVID-19 pandemic, regarded as one of humanity's worst calamities in recent history, were initially studied in terms of human health, but the epidemic also had sociocultural, economic, and psychological consequences (Zacher and Rudolph, 2021). The closure of institutes and dual role maintenance at home triggered work–family conflicts at the most, as escalated role expectations triggered stress (Hong et al., 2021; Antino et al., 2022) along with increasing familial or financial obligations (Bozkurt et al., 2020). The COVID-19 pandemic has increased the difficulties the workplace is already facing (Ratten, 2020), making the distinction between the home and the office hazier than ever before (Chang et al., 2010). So, work–family conflicts and family–work conflicts are the most common byproducts of COVID-19 pandemic work practices.

The pandemic-induced unfavorable scenarios had an important psychological outcome in the form of a reduction in overall life satisfaction (Karakose et al., 2021). Individuals' preferred work–life is more than just a job; it is a phenomenon that incorporates their aims, aspirations, and talents, and it is a key aspect in assuring their happiness in life (Samanta et al., 2021). As millennials currently make up the majority of the workforce worldwide (Naderi and Van Steenburg, 2018) who are labeled as "Me, me, me generation" (Wood, 2019), give prime importance to the ideology of personal well-being and work–life balance (Roestenburg, 2020). Individuals' life satisfaction and job satisfaction are affected by direct or indirect stress sources from the teaching profession (Çelik and Üstüner, 2018). Research suggests that an individual's work–life balance, work, and family conflicts are associated with job satisfaction, life satisfaction, and family satisfaction (Allen et al., 2010). The unprecedented demands from education sector employees to facilitate the smooth conduct of educational operations prompted a rapid increase in work burdens, pushing employees to work beyond office hours with resource constraints resulting in conflicts and ambiguities regarding the roles performed. Role stress results from a mismatch between an individual's understanding of a given role and their current role while executing the assigned tasks (Pereira et al., 2022). According to boundary theory presented by Ashforth et al. (2000), when people think there is role overload in a specific domain, they would reallocate their resources among other roles to complete the interdomain transition resulting in role conflicts (Mellner et al., 2021). So, the role of leaders in chaos plays a vital role in managing employee job satisfaction and life satisfaction for which maintaining work and family conflicts should be the prime focus of today's pandemic-induced HR strategies within organizations.

The COVID-19 pandemic drove the globe to respond in novel and unorthodox ways (Nissim and Simon, 2020). Although the pandemic has brought many misfortunes, agile leadership has emerged as a new norm. Agile leadership has become an essential organizational component in times of acute crisis (Al Fannah et al., 2020). It was the need of the time to reach a quick solution, one that relied on flexibility and agility in unexpected circumstances. It was especially important to retain and continue organizational activities and to manage the transition from a professional educational environment to a system of distant study, teaching, practice, and administration (Nissim and Simon, 2020). So, agile leadership practices aiding flexibility, adoption, innovation, and responsiveness helped organizations steer through these traumatic times of pandemic, especially in the education sector where an emergency was declared in the name of "emergency remote education (ERE)" as an obligation rather than an option (Bozkurt et al., 2020; Eichenauer et al., 2022) and the governments and educational institutes were struggling to ensure quality education without much disruption. Keeping in view the severity of the issue, no such study exists in the extant literature which examined the role of agile leadership and its subjective behavioral outcomes regarding inter-role conflict management effecting job and life satisfaction at the same time, during the times of pandemic.

So, this study is inspired by the situation of Pakistani higher education institutes, which collectively struggled very hard to fulfill their responsibilities on two critical fronts, i.e., toward their students as well as toward their employees. This study focuses on studying the role of agile leadership in managing the conflicts and behaviors of education sector employees during the COVID-19 pandemic. So, it contributes theoretically to the extant literature by examining how agile leadership practices in the education sector can help enhance job satisfaction and life satisfaction of teaching faculty by mitigating the spillover effects of work–family conflicts and family–work conflicts during the COVID-19 pandemic, keeping in view the intervening character of role stress which triggers conflicts either way. **Figure 1** below presents the proposed model of the study, explaining the conceptual relationships among the study variables.

Literature review

This study is based on the Work–Home Resources (W-HR) model presented by Ten Brummelhuis and Bakker (2012). The theory postulates that contextual work resources enhance family outcomes through increases in other resource categories, such as capital and close-to-home personal resources. Resources augment personal resources at work and home. These individual assets can be used to enrich outcomes at home and work. Work–home enrichment can be thought of as the process through which personal resources are developed using contextual resources from both the home and work. After that, performance in the other domain is made easier by the personal resources developed in each domain. A good mood and improved self-esteem, for instance, may result from the spouse's emotional support (a contextual resource). A strong and resilient work attitude or even better job performance may result from using such personal resources at work. The contextual resource support (leadership) from organizational culture and context may help enhance the resources and provide meaning to work and life.

This study is supported by W-HR resources model by explaining that agile leadership is an organizational contextual resource supportive element that can enable the personal resource replenishment (time, energy, and moods) resulting in lesser family and work conflicting outcomes. Resultantly, lesser the work and family conflicts higher will be the levels of job satisfaction and life satisfaction enhancing performance in both domains as suggested by W-HR model.

Agile leadership and inter-role conflicts (work–family and family–work conflicts)

Agile companies and organizations that are adept at anticipating change and adapting to it in ways that efficiently handle stakeholder and technical complexity are the key to sustained success. To develop agile organizations, agile leaders are vital (Joiner and Josephs, 2007). The direction on what to do, what to anticipate, and how to respond comes from leaders. Strong, composed, reliable leadership is more necessary than ever in tumultuous and uncertain times). It is the capacity to function well as a leader in situations of great complexity and quick change (Joiner and Josephs, 2007). The research described it as the type of leadership that exemplifies actions that add value, lower levels of waste associated with ideas and unproductive connections, and foster high levels of cooperation (Mollet, 2021).

The COVID-19 epidemic has brought up unusual circumstances that call for novel ways to leadership practices. It began as a health emergency before spreading fast, paralyzing the worldwide economy, social scene, education, and health care systems (Thu et al., 2020). The "suspended life without suspension" changed how people behaved (Hong et al., 2021). Every aspect of people's personal and professional lives has changed significantly (Pokhrel and Chhetri, 2021). When a crisis brings issues for leaders, the same brings anxiety and stress for employees as well, often resulting in high turnover rates (Eichenauer et al., 2022). Many administrators in the education sector underestimate the risk of occupational stress, especially those new to the profession (Boyatzis et al., 2005). Among individuals, quarantine and social isolation caused many acute and chronic psychopathological issues, including stress, anxiety, depression, nervousness, and insomnia. These stressors triggered chronic work and home conflicts (Antino et al., 2022). The recent unprecedented telework arrangements brought challenges as both employees and leaders were not prepared to handle the inadequacy of home environments, severe childcare lapses, lack of technological competencies, lack of information, lack of teaching infrastructures at home, parallel management of families and work, internet connectivity, and other issues (Pokhrel and Chhetri, 2021; Eichenauer et al., 2022) causing stress to take over.

Family–work conflict is one of the several outcomes that can be defined as "a chronic inter-role stressor that captures the process whereby the family role detracts from the time, attention, and performance of the work role"

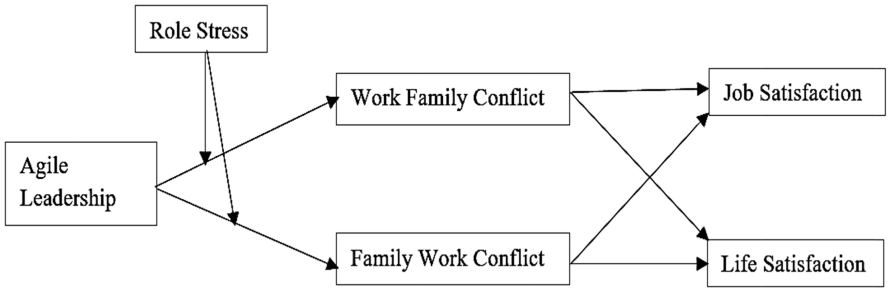

FIGURE 1
Proposed conceptual model.

(Badawy and Schieman, 2020). The boundary fading between work and family and pushing to shift work at home disturbed the balance and resulted in inter-role conflicts more easily. In connection with family–work conflict, the second most relevant outcome of this scenario in the VUCA world happens to be the work–family conflict which can be defined as "a form of inter-role conflict in which the role pressures from the work and family domains are mutually incompatible in some respect". Work–family conflict is a type of inter-role conflict in which the demands of the roles in the work and family spheres are, in some ways, contradictory (Greenhaus and Beutell, 1985). The dual stressors, i.e., work and family together, posed a challenge, especially for education sector employees. Teachers had to educate other children (job demands) as well as their own at the same time (family demands), which caused imbalance (Hong et al., 2021). The ability to allocate, reallocate, and align resources according to work and family commitments is a challenge. The execution of parental duties, for instance, could be hampered by dedicating too many resources to work. The requirements of the work domain hamper the family's needs. On the other hand, the achievement of their work-related activities is hampered by the excess of parental resources (Karakose et al., 2021).

Work–family conflict model presented by Frone et al. (1992) still dominates the literature. The model is based on the hypothesis that if people's problems at work begin to interfere with their capacity to fulfill their family commitments, then these unfulfilled obligations may interfere with their ability to perform their daily tasks at work. On the other hand, people's ability to function at home may start to suffer when their concern over family obligations starts to prevent them from performing their obligations at work (Karakose et al., 2021).

The dynamic accumulation model presented by Frese and Zapf (1988) shows that different individuals react to different stressors with varied symptoms and reactions in the context of feelings of job insecurity and work and family conflicts. A leader's stress management skills, empathy, optimism, credibility, honesty, transparency, and interpersonal relationships play a strong role in mitigating the effects of stress among employees (American Psychological Association [APA], 2020). Research suggests that successful leaders in the times of crisis show both agentic and communal behaviors (Snyder, 2012). When a leader has agile leadership skills, he can be flexible and lift the team's abilities, allowing them to contribute more to the organization's development (Setiawati, 2021). Creating an environment that encourages everyone to approach problems creatively is the main responsibility of an agile leader. To achieve this, one must promote a sense of purpose shared by all and develop a capacity for quick learning. Agile leaders understand that this is not the time for conceit or exclusivism. However, all leaders know that they must learn how to influence their subordinates; however, few leaders consider doing so with individuals who do not directly report to them but have an impact on the future of their team (Hill, 2020).

Agile leaders are always involved with their employees, their families, customers, partners, suppliers, group members, staff, and other stakeholders in their business ecosystem. An agile leader listens and communicates. They spend much time interacting with the outside world (Setiawati, 2021). Consequently, while effective managers will exhibit agentic, task-oriented behaviors, and subordinates also consider social behaviors—such as demonstrating flexibility, social support, and sensitivity to work/family balance—to be more crucial for managers to exhibit in this disruptive environment along with agentic behaviors (Eichenauer et al., 2022). Agile leadership helps employees develop job embeddedness, which in turn helps enhance employee work–life balance and job satisfaction (Akkaya et al., 2020). Employees who relate to their workplace through effective leader–employee relations are better able to balance work and family obligations and are typically happier in their jobs (Mitchell et al., 2001; Safavi and Karatepe, 2018).

Agile leadership prioritizes useful ideas, values time, employs adaptable abilities, and tries to refrain from negative behaviors that drain resources (Shamani and Abbas, 2020). Organizations should focus on long-term solutions rather than quick fixes when addressing variables that could lead to work and family conflicts (Smith et al., 2022). Interference between work and family significantly and negatively affects both burnout and intention to quit, but work support from one's top manager and leader moderates and reverses this influence (Jia and Li, 2022). Research repeatedly demonstrates a negative relationship between work–family conflict and support at work, particularly supervisor support (Anderson et al., 2002; Frye and James, 2004; Weale et al., 2021; Chang et al., 2022). Leaders and supervisors have mutual role expectations. It leads to a worldview that disregards organizational hierarchy in favor of a partnership in which both sides believe that their investment merits a commensurate response. As a result, the dynamic between the leader and the team affects a variety of work situations, including how well work and personal life are separated (Toscano et al., 2022). Keeping in view the literature cited above, this study hypothesizes that:

> **H1:** Agile leadership practices have a direct negative relationship with family–work conflict.

> **H2:** Agile leadership practices have a direct negative relationship with work–family conflict.

Inter-role conflicts and individual satisfaction (life and job satisfaction)

A person's work-life balance, work-family conflicts, job satisfaction, life contentment, and family satisfaction are all related to each other (Allen et al., 2010). Although role pressures, work–family conflict, and job satisfaction have been the focus of previous research studies (Beham et al., 2011; Ten Brummelhuis and Bakker, 2012), little is known about education sector employees' work–family conflict and its effects during the severe public health emergency (Hong et al., 2021). Extant literature is available on the variables that impact levels of satisfaction among individuals investigating various demographic traits claiming that nature of work, working environment, and subjective factors as significant determinants (Çelik and Üstüner, 2018). Neugarten et al. (1961) were the first to define satisfaction as the state of meeting an individual's needs, expectations, and wants. There are several aspects of satisfaction, out of which job satisfaction and life satisfaction have been the focus of attention for most researchers mainly because of their importance for individual- and organizational-level performance outcomes. According to Şirin and Döşyılmaz (2017), life satisfaction is a cognitive aspect of subjective well-being and an emotional state that results from contrasting what a person has accomplished in life with what they hope to acquire from it. Similarly, job satisfaction is another aspect of a pleasurable emotional condition brought on by an evaluation of one's professional experiences on the job (Yousef, 2017).

In the work–family conflict model, Frone et al. (1992) assumed a cross-domain interaction, indicating that family-to-work conflict mostly affects the work domain. This presumption is justified by the notion that, despite its inception in one domain, the dispute contributes to issues in the other area. In turn, this other life domain's well-being decreases as a result. A crucial outcome variable in the work–family conflict model is job satisfaction in the workplace (Amstad et al., 2011). Workplace well-being comprises more than just coping; it also includes having a fulfilling life, being optimistic, succeeding, and prospering (Bennett et al., 2017). As people embark on the work–life journey, it becomes crucial to consider one's overall well-being and ability to strike a balance between professional and social responsibilities, as incompatibilities between these responsibilities have been shown to have minimal positive effects on one's job and quality of life (Allen et al., 2000). People blame their circumstances at work, which in turn causes them to have unfavorable/favorable feelings toward their employment and affects their job satisfaction (Hong et al., 2021). Additionally, according to Diener (2000), contented individuals perform better at work and are more likely to record favorable outcomes. Working remotely created the possibility of family–work conflict when such balance was more difficult to attain (Galanti et al., 2021; Xiao et al., 2021), which effected the satisfaction levels of employees during pandemic (Toscano and Zappalà, 2020). Henceforth, there is a correlation between individual satisfaction and work and family-related conflict (Hong et al., 2021). Accordingly, based on the above literature review, it is hypothesized that:

> **H3:** Family-to-work conflict has a direct negative relationship with job satisfaction.

> **H4:** Family-to-work conflict has a direct negative relationship with life satisfaction.

> **H5:** Work-to-family conflict has a direct negative relationship with job satisfaction.

> **H6:** Work-to-family conflict has a direct negative relationship with life satisfaction.

Agile leadership, inter-role conflicts, and individual satisfaction

Even though all leaders are aware of the need to develop their ability to influence those who report to them; however, few leaders understand that positive or negative spillovers from work also impact those who are indirectly related to the organizations, especially the families (Hill, 2020). An agile leader is more connected to its outside world with more flexibility and acceptance of issues related to internal and external stakeholders (Setiawati, 2021), exhibiting both communal and agentic behaviors (Snyder, 2012). They are more sensitive to helping employees balance work and family domains (Eichenauer et al., 2022), facilitating them to make a maximum contribution toward organizational development (Setiawati, 2021). It has been discovered that more organizational agility significantly improves performance, empowers employees, develops their competencies, fosters a customer-centric culture, and increases job satisfaction (Peters et al., 2020).

Irrespective of the fact that leaders try their best to mitigate the negative impacts of the VUCA world, the behaviors of individuals from different generations respond differently to achieving life and job satisfaction. According to Cran (2014), millennials will change jobs at least twenty times more than previous generations. If they see their supervisor or teammate acting like a friend, the millennials will be satisfied with their jobs and stay with the company. When they do not like their boss, millennials will quit their jobs without hesitation. Seeing these unique characteristics of millennials, the VUCA situation is a challenge for organizations, given that millennials will soon become much of the population in organizations or companies. Instead of working to meet their basic needs, millennials want to make a greater impact on both their lives and the lives of others (Myers and Sadaghiani, 2010). One of a supervisor's main responsibilities is to support his or her subordinates socially as they hold positions in which they can regulate incentives, protection, encouragement, and inspiration for workers (Avolio and Sosik, 1999). Therefore, under these circumstances, agile leaders enhance job commitment and embeddedness, which in turn helps balance work and family, resulting in better job and life satisfaction (Akkaya et al., 2020). Effective leader–employee relationships enable employees to relate to their workplace, which often results in happier and more satisfied workers who are better able to balance work and family conflicts (Mitchell et al., 2001; Safavi and Karatepe, 2018). To increase job satisfaction and life satisfaction, managers can help staff by allowing work flexibility, fostering trust and autonomy, and fostering a supportive and low-stress work environment (Ahn, 2007). Hence, the following hypotheses have been developed based on the literature given above:

> **H7:** Family-to-work conflict mediates the relationship between agile leadership and job satisfaction.

> **H8:** Family-to-work conflict mediates the relationship between agile leadership and life satisfaction.

> **H9:** Work-to-family conflict mediates the relationship between agile leadership and job satisfaction.

> **H10:** Work-to-family conflict mediates the relationship between agile leadership and life satisfaction.

Role stress

The direct and indirect relationships between work overload, stress, work–family conflict, and job satisfaction have been studied. Job satisfaction of employees working in the education sector is impacted by dual role overload, resulting in work and family conflicts in the context of the COVID-19 epidemic that is sweeping the globe, but this is still an area that needs further research (Hong et al., 2021). During the COVID-19 outbreak, in terms of teaching and learning continuity, students suddenly had to direct and regulate their learning and become digitally savvy; educators had to switch to online teaching overnight regardless of their comfort level, familiarity, or training in digital pedagogies; and parents had to morph into dual roles as parent–educators. This has put much psychological pressure on everyone because the transition to internet media necessitates a specific set of technical and pedagogical knowledge and skills. The steep learning curve and information overload, particularly for individuals unfamiliar or inexperienced with online learning and teaching, may have a detrimental influence on learners, who may feel demotivated and disheartened (Liyanagunawardena et al., 2013; Liyanagunawardena and Williams, 2021).

According to previous research (Beham et al., 2011; Ten Brummelhuis and Bakker, 2012; Armstrong et al., 2015; Lambert et al., 2019; Olaniyan, 2020), job overload and work-to-family conflict correlate positively. Research conducted on a sample of 337 Chinese preschool teachers, contested that work stress worsens work–family conflict (Gu and Wang, 2021). One's judgment of life and job satisfaction is impacted by perceptions of work overload (Cao et al., 2020). In addition to facing difficulties at work, people are also coping with personal problems brought on by the epidemic, such as grief, anxiety, and social isolation (UCSF Weill Institute for Neurosciences, 2020). Employees surely find it more challenging to continue doing work-related tasks than before the epidemic, given this exceptional situation (Eichenauer et al., 2022). Individual contentment is impacted by either direct or indirect stressors associated with the teaching profession (Çelik and Üstüner, 2018). Teachers experience family role stress and work role overload when the workplace is moved into the home, especially if they have children (Xu, 2016). Parental stress during their in-home quarantine greatly increased during COVID-19 because, more specifically, mothers had more frequent and prolonged contact with their kids (Hong et al., 2021). Research suggests that lowering role conflict, role ambiguity, role overload, and work–family conflicts through raising engagement in decision-making and job variety might increase commitment and satisfaction (Griffin, 2001; Hogan et al., 2006; Lambert and Hogan, 2009). Keeping in view, the above literature following statements are hypothesized:

> **H11:** Role stress acts as a moderator on the direct relationship between agile leadership and family–work conflict.

> **H12:** Role stress acts as a moderator of the direct relationship between agile leadership and work–family conflict.

Research methods

Measures

This is a quantitative study, and the measures used were adopted from the extant literature available in this domain. To measure all the variables of the study a 5-point Likert scale was used (1 = strongly disagree and 5 = strongly agree). During phase 1 (From February 15, 2022 to February 28, 2022), to measure agile leadership, 32-item scale of agile leadership was developed by Akkaya et al. (2020); for measuring job satisfaction, 3-item scale was developed by Spector (1985); and for measuring life satisfaction, 5-item scale developed by Shin and Johnson (1978) was used. During the second phase of data collection (From April 01, 2022 to April 15, 2022), for measuring work–family conflict and family–work-conflict, 10-item scale was developed by Netemeyer et al. (1996), and for measuring role stress scale developed by Rizzo et al. (1970) and Imoisili (1986) was used.

Sample and procedure

For this study, the data were collected through a self-administrative survey method, from male and female faculty working in higher education institutes of Pakistan in the Rawalpindi and Islamabad regions. Sampling unit included research assistants, lecturers, assistant professors, associate professors, and professors. The purposive sampling technique was used for selecting a sample for the study. Educational institutes were selected because during the COVID-19 public health emergency; the education sector was the second most affected segment of industries after the health care sector (Gautam et al., 2022; Nayak et al., 2022). The reason for selecting faculty members was the panic, pressure, and stress on them to manage the smooth conduct of the education delivery without disruption, which wreaked havoc on their personal and professional lives.

Pilot study

A pilot test was done prior to administering the surveys to analyze the contextual validity of the constructs. Twenty questionnaires were distributed among the faculty members of two universities. After analyzing the results, a high intercorrelation was detected among the items of family–work conflict and work–family conflict. To reduce this high intercorrelation, a focus group was conducted with three HR and two research professors. Upon their suggestions, three items from both variables were removed (showing high intercorrelation), and only two items from each variable were retained, which were showing better impact.

Common methods variance

To investigate common methods variance, Harman's single-factor test (Gannon et al., 2021) was conducted. The highest portion of variance explained by a single factor was 29.36% (threshold 40%), while the main factors of the study explained 85.39% of the cumulative variance. A common method factor was used in the structural model by using an unmeasured method factor approach (Liang and Chia, 2014). This showed that the average variance was 67%, and the average method-based variance was 1.4%, displaying a ratio of 48:1. Hence, according to Hair et al. (2017), CMV is not a concern for this research. For reducing social desirability bias, (i) before administering the questionnaire, participants were informed about voluntary participation and data confidentiality terms, and a code specific to them was assigned, (ii) during questionnaire design phase, dependent and independent variables were placed in separate sections and were distributed in different phases.

Data collection

Two questionnaires were administered 1 month apart with the assistance of volunteers and HR departments of educational institutes. The survey forms were in Urdu, a procedure of back-to-back translation was adopted to convert scale items from English to Urdu with the help of two lecturers of the Urdu department, which were later back-translated by two professors of English.

During the first phase (From February 15, 2022 to February 28, 2022), demographic information and data for agile leadership, job satisfaction, and life satisfaction were collected.

While information regarding work–family conflict, family–work conflict, along with the moderating effect of role stress, was collected in the second phase (From April 01, 2022 to April 15, 2022).

Descriptive statistics

During the two phases, a total of 450 questionnaires were distributed. As suggested by Bougie and Sekaran (2019) for a quantitative study, a sample of more than 30 and less than 500 is appropriate; 387 filled questionnaires were received back. Out of these, only 362 were used for final data analysis, and the rest were excluded because of their insufficiency in fulfilling reliability and validity criteria. The response rate of the study is 80.44%. Based on the demographic information, 51% of the participants were females and 49% were males. The majority (35.66%) of the participants were aged between 35 and 50 years of age, 53.04% of the respondents were working as lecturers, were unmarried (53.8%), and they were working for more than 5 years with the current organization (50.29%). Moreover, most of the participants were from private sector higher educational institutes (64.64%). Descriptive statistics are presented in **Table 1** below.

Results and findings

Confirmatory composite analysis

To confirm the validity and reliability of the study scale, confirmatory composite analysis (CCA) is used (Henseler et al., 2014). **Table 2** below shows the indicator loadings of all the study variables. Results confirm that all the indicator loadings are above the threshold level of 0.5 (Hair et al., 2020), ranging from 0.672 for AgileL 5 to 0.920 for LS3. One item RS5 has a low indicator value (0.419); however, it is retained for analysis. According to Hair et al. (2020), items with indicator loadings falling within the range of 0.40 and 0.70 should be considered for deletion only if deleting the items increase the composite reliability (CR) and average variance extracted (AVE) levels, affecting content validity of construct. As the CR and AVE values had shown no significant improvement, hence, no item was deleted at this stage. One item RS9 had an outer loading of 0.363 that was deleted because of a validity compliance issue.

TABLE 1 Descriptive statistics.

Demographics	Characteristics	Frequency	Percentage (%)	Skewness	Kurtosis
Gender	Male	177	49%	0.062	0.563
	Female	185	51%		
	Total	**362**	**100**		
Age (years)	20–34	117	32.31	0.308	0.270
	35–50	129	35.66		
	51–64	97	26.78		
	65–80	19	5.25		
	Total	**362**	**100**		
Designation	Professor	17	4.69	0.541	0.271
	Associate Professor	32	8.84		
	Assistant Professor	94	25.97		
	Lecturer	192	53.04		
	Research Assistant	27	7.46		
	Total	**362**	**100**		
Marital status	Married	167	46.2	0.236	0.221
	Unmarried	195	53.8		
	Total	**362**	**100**		
Tenure (years)	Less than a year	76	20.99	0.426	0.245
	1–5 years	104	28.72		
	More than 5 years	182	50.29		
	Total	**362**	**100**		
Sector	Public	128	35.36	0.231	0.310
	Private	234	64.64		
	Total	**362**	**100**		

n = 362. Bold values represent the total responses and the total of the percentage.

TABLE 2 Indicator loadings.

	AgileL	FWC	JS	LS	RS	WFC
AgileL 1	0.761					
AgileL 10	0.719					
AgileL 11	0.682					
AgileL 12	0.734					
AgileL 13	0.677					
AgileL 14	0.714					
AgileL 15	0.802					
AgileL 16	0.707					
AgileL 2	0.747					
AgileL 3	0.789					
AgileL 4	0.697					
AgileL 5	0.672					
AgileL 6	0.692					
AgileL 7	0.719					
AgileL 8	0.795					
AgileL 9	0.754					
AgileL 10	0.742					
AgileL 11	0.691					
AgileL 12	0.711					
AgileL 13	0.752					
AgileL 14	0.810					
AgileL 15	0.791					
AgileL 16	0.689					
AgileL 17	0.722					
AgileL 18	0.687					
AgileL 19	0.776					
AgileL 20	0.842					
AgileL 21	0.786					
AgileL 22	0.757					
AgileL 23	0.677					
AgileL 24	0.779					
AgileL 25	0.767					
AgileL 26	0.698					
AgileL 27	0.833					
AgileL 28	0.721					
AgileL 29	0.797					
AgileL 30	0.743					
AgileL 31	0.684					
AgileL 32	0.789					
FWC1		0.843				
FWC2		0.911				
JS1			0.798			
JS2			0.895			
JS3			0.695			
LS1				0.689		
LS2				0.798		
LS3				0.920		
RS1					0.751	
RS10					0.817	
RS11					0.737	
RS12					0.736	
RS13					0.764	
RS14					0.768	
RS15					0.833	
RS2					0.752	
RS3					0.695	
RS4					0.757	
RS5					0.419	
RS6					0.625	
RS7					0.655	
RS8					0.707	
WFC1						0.893
WFC2						0.829

(Continued)

TABLE 2 (Continued)

n = 362.

The measurement model in Figure 2 below shows the measurement model used for this study.

Table 3 below shows the internal consistency measures of the study variables. The results show that the measures used are internally consistent and reliable. All the measures are above the threshold level of 0.70. The values of CA range from 0.714 for job satisfaction to 0.909 for agile leadership. The values of rho_A range from 0.742 for family–work conflict to 0.916 for agile leadership. Consequently, the values of CR range from 0.841 for job satisfaction to 0.921 for agile leadership. Moreover, the AVE values confirm the convergent validity of the measures used, as all the AVE values are above the threshold level of 0.5 (Hair et al., 2020). This confirms that all the items share high levels of interscale correlations conforming to standards of convergent validity.

For measuring discriminant validity, Fornell–Larcker and Hetro-Trait Mono-Trait criteria are used. The results in Table 4 below show that for the Fornell–Larcker criterion, all the diagonal values are greater than all the non-diagonal values. Moreover, all the HTMT values are below the threshold level of 0.90, establishing the discriminant validity of the scales used and determining that each scale measures dissimilar traits. Consequently, the complete bootstrap tests show that confidence intervals at a minimum of 2.5% and a maximum of 97.5% do not contain zero (Hair et al., 2020), which further confirms the discriminant validity. Figure 3 below shows the reliability model of variables used for the study.

Structural model

Figure 4 below shows the structural model of the study.

For testing the hypothetical model, the structural model assessment was performed through bootstrapping using

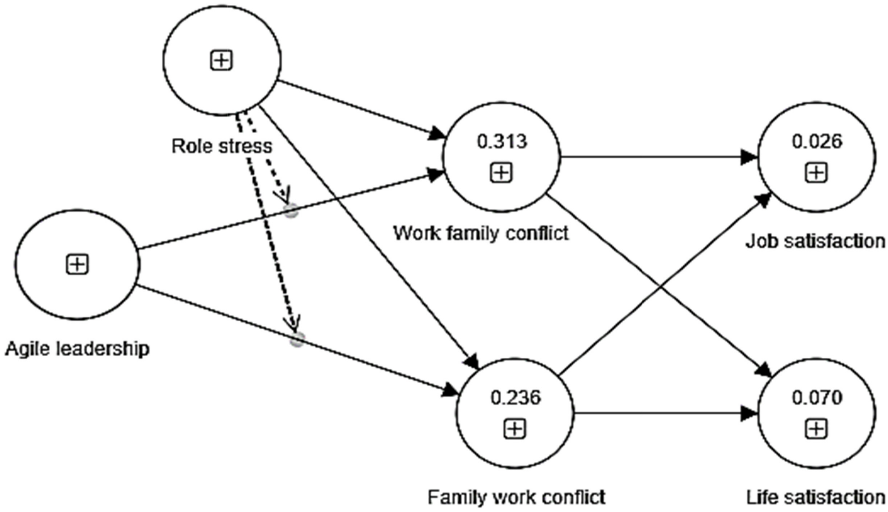

FIGURE 2
Measurement model.

TABLE 3 Internal consistency reliability.

	CA	rho_A	CR	AVE
Agile leadership	0.909	0.916	0.921	0.628
Family–work conflict	0.708	0.742	0.871	0.771
Job satisfaction	0.714	0.743	0.841	0.640
Life satisfaction	0.765	0.787	0.755	0.727
Role stress	0.878	0.886	0.892	0.667
Work–family conflict	0.755	0.776	0.852	0.742

n = 362.

5000 samples. No multicollinearity was established through collinearity statistics as all the values were below the threshold level of 5. Table 5 below shows the results of structural model assessment. The estimates of direct relationships among variables show that agile leadership has a significant negative relationship with family–work conflict (FWC) H1 (β = −0.4539, *t*-value = 9.4167, *p*-value = *0.0000*) and work–family conflict (WFC) H2 (β = −0.5537, *t*-value = 10.4626, *p*-value = *0.0000*). FWC has a significant negative relationship with job satisfaction (JS) H3, (β = −0.3710, *t*-value = 8.6111, *p*-value = *0.0012*) and life satisfaction (LS) H4 (β = −0.2760, *t*-value = 5.6029, *p*-value = 0.0106). Similarly, WFC has significant negative relationship with JS (β = −0.1670, *t*-value = 2.5562, *p*-value = 0.0006) H5 and LS (β = −0.2589, *t*-value = 4.8564, *p*-value = 0.0046) H6. Moreover, all the values of bias-corrected confidence interval do not contain zero within, which establishes the stability of path coefficients.

Mediation analysis for the specific indirect relationship of AgileL -> FWC -> JS shows that family–work conflict partially mediates the direct relationship of agile leadership with job satisfaction, H7 (β = 0.1598, *t*-value = 9.6102, *p*-value = 0.0017). For AgileL -> FWC -> LS, the results show that FWC also partially mediates the direct relationship of agile leadership with life satisfaction H8 (β = 0.1160, *t*-value = 7.5989, *p*-value = 0.0093). For AgileL -> WFC -> JS, the results show that work–family conflict mediates the direct relationship of agile leadership and job satisfaction H9, (β = 0.102, *t*-value = 2.5142, *p*-value = 0.0112). Similarly, for AgileL -> WFC -> LS, mediation analysis indicates that work–family conflict also mediates the direct relationship of life satisfaction H10 (β = 0.136, *t*-value = 4.8707, *p*-value = 0.0014). The values of bias-corrected confidence intervals establish that mediational paths are stable and significant.

To estimate the significance of the moderation effect of role stress on the direct relationship of agile leadership with family–work conflicts and work–family conflicts, bootstrapping procedure with 5,000 iterations was performed. Results of moderation in Table 6 below reveal that role stress significantly moderates the direct relationship of agile leadership with family–work conflict H11 (β = 0.2530, *t*-value = 10.0185, *p*-value = 0.0152) and work–family conflicts H12 (β = 0.3611, *t*-value = 17.8872, *p*-value = 0.0012). The direct relationship of agile leadership with FWC and WFC shows a negative relationship showing that the increasing levels of agile leadership practices help reduce family and work conflicts. However, when the role stress increases, the direction of the predicted direct relationship changes, which signifies that as the role stress increases, the levels of FWC and WFC increase as well. This establishes the significance of the moderating impact of role stress.

The blindfolding procedure to determine the predictive ability of the study model is used with an omission distance

TABLE 4 Discriminant validity measures.

	Fornell–Larcker						HTMT					
	AgileL	**FWC**	**JS**	**LS**	**RS**	**WFC**	**AgileL**	**FWC**	**JS**	**LS**	**RS**	**WFC**
AgileL	**0.654**											
FWC	0.481	**0.878**					0.564					
JS	0.176	0.201	**0.801**				0.251	0.112				
LS	0.328	0.107	0.430	**0.654**			0.343	0.143	0.707			
RS	0.376	0.242	0.450	0.448	**0.606**		0.328	0.241	0.553	0.743		
WFC	0.552	0.228	0.154	0.270	0.231	**0.861**	0.694	0.349	0.219	0.258	0.242	

n = 362. Diagonal bold values represent Fornell Larcker criterion values which must be higher from all other values in respective columns.

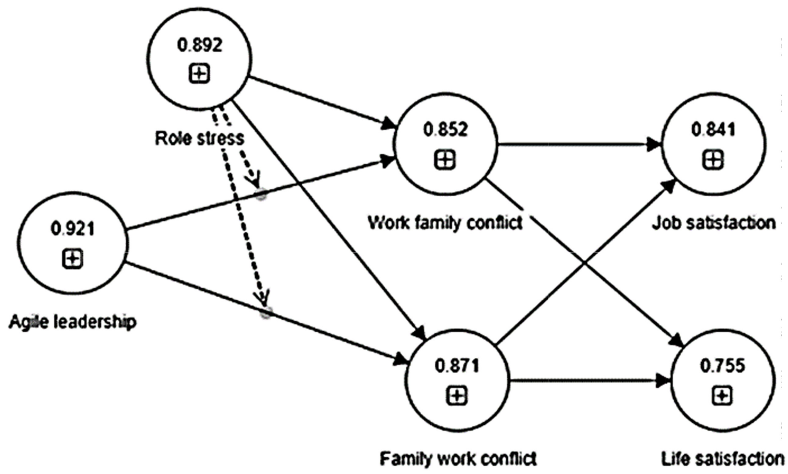

FIGURE 3
Reliability model. *The values within the variable show composite reliability of the constructs of the study.

of 7. Results in Table 7 below show construct cross-validity redundancy. All the Q^2 values are well above zero, signifying that the model is predictive of the hypothesized relationships. Family–work and work–family conflicts show medium levels of predictability, while job satisfaction and life satisfaction show small levels of predictive model ability. This establishes that these variables can be kept in the model having significant levels of predictive ability to predict endogenous variables.

Discussion, conclusion, and implications

Discussion

The COVID-19 pandemic has been the worst public health emergency witnessed by the people of this century, causing agony and turmoil around the globe (Mallah et al., 2021; Panneer et al., 2022). The initial impacts were thought to be limited to individual health only; however, as the periods of quarantining and expanse of disease spread increased, it was observed that impacts of this public health emergency are not just limited to health and are far beyond what was realized. Since its outbreak, organizations have been under siege by changing scenarios and emerging challenges on the fabric of the world's business platforms (Fitzpatrick, 2022). More so, the need for effective leadership has never been so fervently understood as in this VUCA world scenario (Botbyl, 2022). These testing times were the incubator for testing agility at organizational and individual levels (Frare and Beuren, 2021). Numerous studies have shown that the teaching profession is characterized by a high rate of discomfort, dissatisfaction, an increased workload, and stress. This pandemic's problems have gotten worse, making it challenging for teachers compelling them to teach online without any significant support. COVID-19 caused significant, ongoing unfavorable modifications in teaching methods for instructors all around the world (Guoyan et al., 2021). Before COVID-19, the United Nations Development Programme [UNDP] (2019), rates Pakistan at 152 out of 189 nations in the UNDP's Human Development Index (HDI) rating. Sadly, Pakistan has not shown improvement in important educational

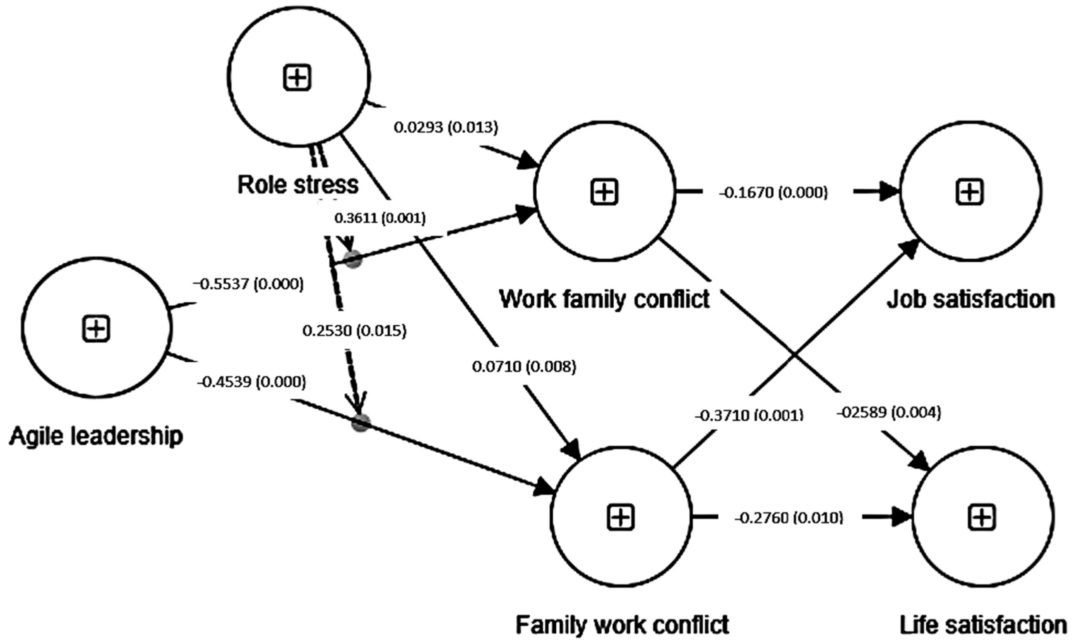

FIGURE 4
Structural model.

metrics including literacy rate, gross enrollment ratio, and investment on education (Guoyan et al., 2021), and the advent of pandemic made it only worse. However, leadership was the differentiating factor in these testing times.

Agile leadership research and its implications have been the focus of attention since the COVID-19 outbreak. The current study has investigated how agile leadership practices influence employees' job satisfaction and life satisfaction through the mediational effects of work–family and family–work conflicts. This study also explored the relationship of role stress as a moderating variable on the direct relationship between agile leadership and inter-role conflicts. As hypothesized, the study found a significant negative relationship between agile leadership and work–family conflicts and family–work conflicts, which are also supported by studies conducted by Akkaya et al. (2020) and Jia and Li (2022). In Pakistani context, research suggests that academic and adaptive leadership helped implement change and develop higher education institutes (Mukaram et al., 2021). For instance, in Pakistan, HEC is dedicated to making e-learning success in the wake of the COVID-19 pandemic, COVID-19-specific policies and procedures and emergent levels of support helped leadership in educational institutes facilitate students and employees at the same time (Mumtaz et al., 2021). Similarly, work–home resources model (W-HR) also supports the findings by explaining that contextual work resources improve family outcomes by augmenting the personal resources of employees. This help caters to the dual role demands of being a family person while working from home and vice versa (Ten Brummelhuis and Bakker, 2012). So, it can be justified that leadership agility in the times of crisis and emergency plays its role in managing inter-role conflicts.

Job satisfaction and life satisfaction are two critical job behaviors. Extant literature talks about the antecedents and outcomes of these aspects of satisfaction (Çelik and Üstüner, 2018). However, in this VUCA world situation during the COVID-19 pandemic, there is a huge gap in research in observing the two job behavioral outcomes under the changed world scenarios (Dima et al., 2021). The education sector, one of the hardest hit sectors, was like a boiling pot with evolutionary changes resulting in stress, depression, anxiety, dissatisfaction, incompetency, and non-willingness to perform (Tang et al., 2021). The "infodemic" in Pakistan resulted in economic instability, individual mental health issues, behavioral problems, and unskilled human capital flow toward industries (Haider et al., 2021). Faculty found it difficult to be flexible enough to become tech savvy and adapt to the changing situations. It was difficult for educational institutions to match the internal pace of change with the external pace of change (Mukaram et al., 2021). According to the W-HR model, as employees develop their resources such as elevated moods, better self-esteem, and positive emotional support, it has a significant impact on performance, as these resources help improve personal resources at work (Ten Brummelhuis and Bakker, 2012). So, this model supports the findings. When leaders are empathetic, support flexibility, and display cooperative behaviors, it is easier

TABLE 5 Direct relationships and mediation analysis.

Direct relationships	Hypotheses	Accepted/Not accepted	β	*t*-values	*p*-values	Bias Corrected CI	
						2.5%	*97.5%*
AgileL -> FWC	H1	Accepted	-0.4539	9.4167	0.0000	0.3550	0.5431
AgileL -> WFC	H2	Accepted	-0.5537	10.4626	0.0000	0.4499	0.6477
FWC -> JS	H3	Accepted	-0.3710	8.6111	0.0012	0.1352	0.2257
FWC -> LS	H4	Accepted	-0.2760	5.6029	0.0106	0.1284	0.1784
WFC -> JS	H5	Accepted	-0.1670	2.5562	0.0006	0.0246	0.2654
WFC -> LS	H6	Accepted	-0.2589	4.8564	0.0046	0.3090	0.3766
Mediation analysis	**Hypotheses**	**Accepted/Not accepted**	**β**	***t*-values**	***p*-values**	**Bias Corrected CI**	
						2.5%	*97.5%*
AgileL -> FWC -> JS	H7	Accepted	0.1598	9.6102	0.0017	0.1048	0.3971
AgileL -> FWC -> LS	H8	Accepted	0.1160	7.5989	0.0093	0.0562	0.0852
AgileL -> WFC -> JS	H9	Accepted	0.1020	2.5142	0.0112	0.0029	0.1533
AgileL -> WFC -> LS	H10	Accepted	0.1361	4.8707	0.0014	0.1460	0.2211

n = 362.

TABLE 6 Moderation analysis.

Moderation effect	Hypotheses	Accepted/Not accepted	β	Simple effect	*t*-values	*p*-values	Bias-Corrected CI	
							2.5%	*97.5%*
RS*FWC -> FWC	H11	Accepted	0.2530	0.0710	10.0185	0.0152	0.0944	0.1158
RS*WFC -> WFC	H12	Accepted	0.3611	0.0293	17.8872	0.0012	0.0025	0.2160

n = 362.

to manage inter-role conflicts, which in turn help employees provide meaning to work and enhance job satisfaction and life satisfaction (Grimes, 2022).

During the times of uncertainty like never before, the need to protect and assist family (family demands) and the need to be an effective employee (job demands) at the same time led to a confused workforce. The role stress increased as job demands became more and more ambiguous (Liyanagunawardena and Williams, 2021; Zheng et al., 2022). Employees lacked the ability to immediately switch to the online mode due to a declared education emergency ending up with "technostress" among Pakistani faculty members. The immediate shutdown of the hustle and bustles of life with ever so-active and busy quarantine life led to role conflicts with employees who were unable to allocate proper time and resources to work and family, resulting in an inability to separate the two while they were not (Mushtaque et al., 2022). This role overload and the increasing demands of managing work and family lead to lower job and life satisfaction levels. Intentions to quit jobs people loved were on an all-time high. The W-HR model supports the findings of this study as it suggests that context-specific variables influence employee behaviors and their outcomes (Ten Brummelhuis and Bakker, 2012).

TABLE 7 Blindfolding.

Variables	SO	SSE	Q^2 (=1 − SSE/SSO)	Remarks
Agile leadership	4896	4896		
Role stress	4590	4590		
Family–work conflict	612	509.3736	0.2677	Medium
Work–family conflict	612	478.1058	0.2188	Medium
Job satisfaction	918	905.3963	0.0837	Small
Life satisfaction	918	910.8047	0.0978	Small

n = 362.

Theoretical implications

This study is a novel addition to the empirical literature available on employee satisfaction in the wake of COVID-19 pandemic VUCA world scenario specifically in Pakistani context, which was not changed ready as per its current economic state and the quality of the infrastructure available. The suggested mechanism is not studied earlier that how agile leadership behaviors can help manage two critical types of resultant role conflicts, i.e., work–family and family–work conflicts, specifically when the world came to a halt and the families were together yet they were the most distant because of the role overload, ambiguous work boundaries, and conflicting roles. Employees once passionate about their jobs as faculty were thinking of quitting because of the reason they were not able to handle the pressures and resultant lack of meaningfulness in job and life. So, this study provides valuable insight into how agile leaders in the times of crisis can manage employee behaviors and the resultant outcomes. Moreover, the education sector is considered as the most contributing sector from the strategic point of view. This study highlights the issues faced by teachers and how the leaders in this domain handled employee issues, helped manage work and family life, and retained their faculty in the times of crises, which benefited the organizations and employees in broader strategic contexts.

Practical implications

Agile leadership behaviors are positive supervisory behaviors that promote flexibility, adaptability, innovation, and creativity. Leaders' social and communal sensitivity in times of crisis helps realize the importance of leadership agility within organizations. This study will help organizations understand how leadership ability can mitigate the effects of uncertainty and risk affecting employees' personal and professional lives. The educational institutes, in addition to the health sector, have witnessed transformational changes and gave new meaning to learning and development for both students and faculty. So, this study is important for higher educational institutes to understand the importance of managing work and family conflicts by emphasizing that managing inter-role conflict is not just the duty of employees, leader's role is of critical importance in uncertain times like these.

Limitations and future directions

This study has collected data from faculty of higher education institutes which played a very critical role in helping students maintain education continuity; however, to ensure the generalizability of the results of this study, future researchers may consider testing the model in the health care sector. Moreover, this study is conducted after the lockdowns are lifted and employees have returned to normal working conditions. Comparative studies can be conducted on the role of agile leaders in health care and education sector institutes. Future researchers may also consider the impacts of role ambiguity, role conflict, and role overload on work–family and family–work conflicts separately. Future researchers may also consider longitudinal and experimental research designs to retest the results of this study. Personal factors such as employee self-efficacy, proficiency in adapting to change, and fear of the COVID-19 pandemic may also be considered antecedents of inter-role conflicts for future research in this domain.

Data availability statement

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

Ethics statement

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

Author contributions

SA conceived the idea of this manuscript and performed the data analysis. SA and AW drafted the original manuscript. SA and AAf collected data for the study. SA and KK contributed in writing methodology. SA, AAf, and AAd contributed in discussion and conclusion sections. AW supervised the writing stage. KK, AAf, and AAd helped in proofreading and revising the manuscript. All authors contributed to the article and approved the submitted version.

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Conflict of interest

Author AAd was employed by Boots UK Limited.

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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The main influencing factors of customer satisfaction and loyalty in city express delivery

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At present, customers' low satisfaction and loyalty to city express service have restricted the development of city express. It is particularly important to analyze the factors causing customers' low satisfaction and loyalty, which will promote the development of city express industry effectively. Based on SERVQUAL model and CCSI model, this paper constructs a new evaluation index system from the perspective of service quality. Through this new system, this paper first explores the factors that affect customers' satisfaction and loyalty, respectively, by fuzzy analytic hierarchy process (AHP) and hierarchical regression analysis, taking the expected and perceived service quality as conversion variables. And then it analyzes the common factors that affect customers' satisfaction and loyalty comprehensively. These two analyses will provide reference for solving the problem of low customer satisfaction and loyalty of city express enterprises. The results show that popularity and credibility, delivery time commitment, and mailing security are the common main factors affecting customer satisfaction and loyalty. Easy-to-understand receipts, the three-level index corresponding to the empathy dimension, is the most significant factor affecting customers' loyalty in city express industry; Delivery time commitment, the three-level index corresponding to the reliability dimension, is the most significant factor affecting customers' loyalty in city express industry.

KEYWORDS
city express, quality of service, customer satisfaction, customer loyalty, FAHP, stratification regression analysis

Introduction

City express service, also known as "the last mile logistics," is one of the three major services in the express industry, with a large market demand and plenty of room for growth. According to State Post Bureau data, the volume of express delivery business in the same city has increased from 2.29 billion pieces in 2013 to 12.17 billion pieces in 2020. Despite the epidemic, it is still growing steadily, with a year-on-year growth of 10.2%, accounting for 14.6% of total express delivery business, making it the fastest growing sub-industry in China's logistics industry. The mature development of city express has become a strong guarantee for the improvement of the operational efficiency of the urban economy.

However, despite the business's growth, service offerings, and product diversification, extensive operation mode has been unable to satisfy demand from customers. The city express industry in China has entered a phase of transition from the initial "labor-intensive" distribution of commodities reliant on manual labor and antiquated mechanical facilities to the "intelligent logistics" of high-tech transformation, artificial intelligence, big data, and high-tech. As a result, issues such a lack of specialization, excessive distribution costs, and subpar after-sales support grow more and more prevalent, which lowers customer happiness and loyalty. The "throwing express" event involving Sto has received a lot of media attention. Only in the first half of 2021, the net loss reached 144 million yuan, and the earnings declined 285.69% year on year, J&T ranked last in the China Post's service satisfaction survey for the third quarter of 2021 at the end of 2021. Many phenomena show that enterprises should no longer simply consider the cost and price, but should pay more attention to customer satisfaction, and change the pursuit of single profit maximization into overall profit maximization. Therefore, how to improve customer satisfaction and loyalty to occupy more market share has become a difficult problem plaguing the development of enterprises.

In the service industry, the overall service quality of enterprises determines the level of customer satisfaction and loyalty. Meanwhile, it is the key to increasing the market share of enterprises. Existing studies on the influencing factors of satisfaction and loyalty mainly focus on hotels and restaurants, e-commerce, tourism, supermarkets, banks, and other aspects. However, there are few studies on customer satisfaction of city express delivery. Therefore, this paper draws on the experience of other industries in customer satisfaction to study city express. The selected research methods also draw on the research contents of other industries. As a result, the motivation for this paper is to determine which aspect of service improvement can more effectively and quickly improve customer satisfaction of city express delivery and thus increase customer loyalty. The main factors affecting customer satisfaction and loyalty are explored by comparing the factor differences between customers' expected revenue before purchasing service and actual revenue after receiving service.

Literature review

Compared with other industries, the products provided by service industries are services. Different from tangible products, service products are more difficult to be measured and perceived due to their unique intangibility, inseparability, heterogeneity, and perishable nature.

The research content of this paper mainly involves three aspects: service quality, customer satisfaction, and customer loyalty. The currently recognized service quality evaluation model was that proposed by Zeithaml et al. (1985). This model measures service quality by measuring the difference between customer service expectation and service perception from five aspects: reliability, responsiveness, security, empathy, and tangible. In addition, Oliver's "expectation inconsistency theory" laid a solid foundation for the research of satisfaction. The research on customer satisfaction in China began in the early 21st century. The research on the satisfaction of express delivery industry focuses on the analysis of influencing factors and innovative evaluation methods. The "attitude loyalty theory" proposed by Hallowell in 1996 provides a theoretical basis for indirect evaluation of service quality by using customer loyalty. The following is an overview of the correlation among the three:

In the field of express logistics, researches on the relationship between service quality and customer satisfaction show that service quality is the primary factor affecting customer satisfaction. In 1980, Oliver (1980) pointed out that service quality is an important driver of customer satisfaction, whether it is transaction-oriented satisfaction or cumulative satisfaction. Based on the theoretical basis of customer satisfaction and express service, Qiyuan (2022) found that service quality has a significant impact on customer satisfaction, and perceived quality is the main factor. However, through systematic theoretical analysis and practical investigation, he found that the corporate image, service quality, and service price had a relatively significant impact on customer satisfaction. Among them, corporate image and service price are the basic factors affecting customer service reliability, responsiveness, convenience, and guarantee were low, it would lead to low customer satisfaction and affect the overall level and quality of express service.

On the whole, there is a significant positive correlation between customer satisfaction and loyalty. As early as 1993, Oliver (1993) proposed that there was a non-linear relationship between customer satisfaction and loyalty. Ming and Luming (2015) empirically analyzed the factors affecting customer loyalty and finally determined that customer expected quality, customer perceived quality, customer perceived value, corporate image, and customer satisfaction were the most important factors among many factors. Zhiyan et al. (2021) interpreted the perceived value with the perceived service quality and the perceived service cost, and established a structural equation model based on the CCSI model. Finally, he proved that perceived service quality and perceived service cost had the most significant impact on customer satisfaction of logistics distribution service, and the impact of brand image could also not be ignored. Meanwhile, customer satisfaction significantly determines customer loyalty.

At present, there are few studies on the relationship between express logistics service quality and customer loyalty. By integrating existing domestic and foreign literature, scholars generally believe that there is a positive correlation, but no direct influence. Rao et al. (2011) found that logistics distribution cost and service quality are key factors affecting customer loyalty in their research. In the study of Taylor and Baker (1994), there was no strong positive correlation between service quality and repurchase tendency. Taylor and Xiao (2010) pointed out that the main factor affecting purchase intention is customer satisfaction rather than service quality, and the customer satisfaction has a significant influence on purchase intention, which is greater than that of service quality. With customer satisfaction and customer trust as the intermediary variable, Ying et al. (2016) research the relationship between logistics service quality and customer loyalty. They found that emergency handling quality, information interaction, and logistics distribution quality had a direct and positive impact on customer loyalty. And the quality of personnel service indirectly affects customer loyalty by affecting the intermediary variable of customer trust.

Research framework and hypothesis development

In order to explore the main factors affecting customer satisfaction and loyalty of same-city express delivery, and at the same time make the results more consistent with the status quo of China's same-city express delivery industry, the CCSI model is combined to correct the model based on the SERVQUAL model in this paper.

In this paper, expected service quality and perceived service quality are added as conversion variables between service quality and customer satisfaction. And the value of expected service quality minus perceived service quality is used as a method to evaluate the influencing factors of customer satisfaction and loyalty. The structural model is shown in Figure 1.

The components of the structural model in this paper present a causal relationship. This paper analyzes the expected service quality of customers before enjoying the service and the actual perceived service quality after experiencing the service from the five dimensions of tangibility, reliability, responsiveness, assurance, and empathy of the express service in the same city. Customers' subjective requirements for perceived service quality will be higher as expected service quality increases. When the expected service quality is high and the perceived service quality is low, the difference between perceived service quality and expected service quality will be smaller, and the customer satisfaction will be low. The decrease of customer satisfaction will lead to the decrease of customers' trust and loyalty to the product, and they will increase conversely. In a word, the model takes into account the comprehensive satisfaction of customers when they choose services and after they experience services, so as to evaluate customers' future purchasing attitudes and achieve synchronous improvement of customer satisfaction and loyalty.

Based on the existing research of city express and combined with the structural model, the author proposed the following hypotheses:

Shuai (2015) put forward that the delivery quality of goods has the greatest impact on customer satisfaction. Customers are most concerned about the security of deliverables, followed by the timeliness and timeliness of delivery.

> *H1*: Timeliness and security factors under the reliability dimension are the most influential factors that affect the change degree of satisfaction of city express delivery.

Zhiyan et al. (2021) solved the problem and concluded that in the logistics distribution industry, expected service quality has a negative direct impact on customer loyalty, while perceived service quality has a positive direct impact on customer loyalty.

> *H2*: The expected service quality of city express is negatively correlated with customer loyalty.

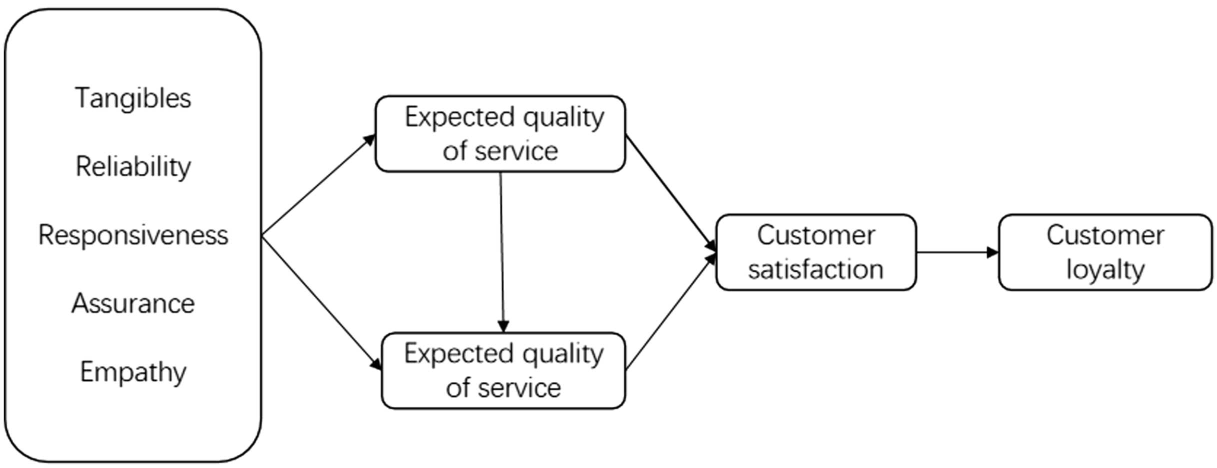

FIGURE 1
Evaluation model.

> *H3*: The perceived service quality of city express is positively correlated with customer loyalty.

Xuefang et al. (2015) pointed out that in the banking industry, customer satisfaction is not equal to customer loyalty, but customer satisfaction has a significant positive correlation with customer loyalty, and the most significant factor affecting customer satisfaction is also the most prominent factor affecting customer loyalty.

> *H4*: The most significant factor for improving the satisfaction of city express delivery is also the most effective factor for improving customer loyalty of city express delivery.

Research design

Evaluation system construction

In this paper, the implicit variables and explicit variables in CCSI model and SERVQUAL model are integrated, and the main reasons for the slowdown of the development of China's urban express delivery industry and the factors causing this phenomenon are combined with the special national conditions of China in the report on the Market Operation management and Investment Prospects of China's Urban Express Delivery Industry in 2021–2027. Establish an index system suitable for the express industry in the same city. This index system is divided into three levels, as shown in Table 1.

TABLE 1 Satisfaction indication system.

First-level indicators	Second-level indicators	Third-level indicators
Customer Satisfaction	Tangibles	Equipment
		Courier staff's dress
		The inquiry way of order
		The complaint channels
		Complaint channels
	Reliability	Popularity and credibility
		Delivery time commitment
		Mailing security
		Matching degree between price and service
	Responsiveness	Diversified distribution methods
		Coverage of outlets
		Order processing speed
		Problem processing speed
	Assurance	Delivery person meter
		Shipment tracking method
		Staff professional ability
		Staff service attitude
	Empathy	Exclusive APP for business handling
		Humanized way of receiving
		Gradient price standard
		Easy-to-understand receipts

Questionnaire and data collection

This chapter designs the questionnaire according to the index system. The collected data will be used as the basic data of hierarchical analysis and fuzzy comprehensive analysis.

The questionnaire is divided into three parts, namely, "basic information," "survey on the perceived service quality of city express," and "survey on the expected service quality of city express." Basic information mainly includes "have you ever used the city express?," "frequency of use," "age," "income," "the company which frequently choose," the reason for choosing this company's services for a long time." According to the satisfaction index system, the survey of perceived service quality (expected service quality) of city express delivery is divided into 5 parts, with a total of 25 questions and measured by Likert-type scale.

This questionnaire was collected from July 2021 to August 2021. It was distributed on multiple network platforms and offline, as well as on WeChat, Weibo, and other communication apps. A total of 327 questionnaires were collected, excluding 20 invalid ones, 307 valid ones were obtained with an effective recovery rate of 93.88%. Among the 307 valid questionnaires, 45 did not use city express, accounting for 14.66%; 32.57% used once a week; Use it once or twice a week 33.55%; Three to five times a week 17.26%; More than 6 times a week 1.95%.

Combined with the questionnaire data, the basic characteristics of the sample are as follows:

1. In terms of age, the main customers of city express are 18–40 years old, accounting for 82.44%;
2. In terms of income, customers with an income of 2,000–8,000 yuan use city express the most, accounting for 75.19%;
3. Yunda Express (23.66%), SF Express (22.9%), and ZTO Express (15.27%) are the top three companies that often choose to provide local express services.

Reliability and validity analysis

In order to ensure that the questionnaire can accurately reflect the question, the reliability and validity of the questionnaire are analyzed first. In the reliability analysis, Cronbach's coefficient (Cronbach α) was used to measure the reliability of questionnaire data. In the validity analysis, KMO sampling suitability quantity and Bartlett Test of Sphericity were used to analyze whether there was a strong correlation between each measurement index. The specific results are shown in Tables 2, 3. The reliability coefficients of the questionnaire are all greater than 0.9, and the KMO value is greater than 0.8. Moreover, the Bartlett sphericity test value of *p* is 0.000, and the variables are not independent.

Findings

Main influencing factors of customer satisfaction

In order to get the main factors that affect the satisfaction of local express delivery, this paper chooses fuzzy analytic hierarchy process to explore.

First, according to the expert questionnaire, using analytic hierarchy process to get the weight, and normalized processing. The calculation results show that the weight vector of second-level index relative to first-level index is Customer satisfaction = (0.12, 0.47, 0.10, 0.23, 0.08); The weight vector of the third-level index relative to the second-level index is: Tangibility = (0.10, 0.05, 0.31, 0.17, 0.37), Reliability = (0.12, 0.42, 0.23, 0.23), Responsiveness = (0.35, 0.35, 0.16, 0.14), Assurance = (0.07, 0.25, 0.51, 0.17), and Empathy = (0.18, 0.35, 0.39, 0.08).

Secondly, score set V = (very dissatisfied, dissatisfied, general, satisfied, and very satisfied) is defined to set the corresponding scoring range, and S is the corresponding score value of comments in V, as shown in Table 4.

Then, fuzzy evaluation matrices of expected service quality and perceived service quality were established respectively, and the comprehensive scores of secondary indicators were shown in Table 5.

As can be seen from Table 5, the difference between reliability and empathy is−0.6 and-0.5, indicating that the perceived value of customers' actual experience does not meet customers' expectations. Improving reliability and empathy can effectively improve overall customer satisfaction. Then, the fuzzy comprehensive evaluation method was used to score the reliability of the second-level indicators and the third-level indicators corresponding to empathy, respectively. The results are shown in Tables 6, 7.

It can be seen from Table 6 that the third-level index corresponding to the second-level index "Reliability" has the largest difference value of "Mailing security" with a different value of-2.4, followed by "Delivery time commitment" and "Popularity and credibility" with a different value of-2.2 and-1.8, respectively. In terms of "Matching degree between price and service," customer perception value higher than expected. As can be seen from Table 7, the third-level indicator corresponding to the second-level indicator "Empathy" has the largest different value of "Easy-to-understand receipts" with a difference value of-2.6, followed by "Exclusive APP for business handling" and "Humanized way of receiving" with a different value of-1.9 and-0.7, respectively. In terms of "Gradient price standard," customer perception value is slightly higher than expected. Therefore, the main factors affecting customer satisfaction of express delivery in the same city are "Popularity and credibility," "Delivery time commitment," "Mailing security," "Exclusive APP for business handling," "Humanized way of receiving" and "Easy-to-understand receipts." Among them, the difference value of "Easy-to-understand receipts" provided is −2.6, which is the most significant factor to improve customer satisfaction.

TABLE 2 Reliability.

	Expected quality of service	Perceived quality of service
Cronbach's Alpha	0.950	0.938
Cronbach's Alpha	0.950	0.939
Number	25	25

TABLE 3 Validity.

		Expected quality of service	Perceived quality of service
KMO		0.960	0.950
Bartlett test	Approx. Chi-Square	3235.411	2781.209
	df	300	300

Main influencing factors of customer loyalty

According to the existing literature, it cannot be directly proved that there is an inevitable connection between the five dimensions of service quality and customer loyalty in the city express delivery industry. In order to solve this problem, hierarchical regression method is adopted in this paper. It is known that there is a positive correlation between customer satisfaction and loyalty. The research in 5.1 proves that perceived service quality and expected service quality have a significant impact on customer satisfaction. Similarly, the five dimensions of service quality have a significant impact on perceived service quality and expected service quality. Therefore, the analysis method in this paper is divided into three layers. The specific results are shown in Table 8.

The basic data used to analyze the main influencing factors of customer loyalty comes from the loyalty questionnaire. According to the evaluation model and literature reference, the index system for evaluating customer loyalty is basically the same as customer satisfaction. It also makes it easier to compare satisfaction with loyalty.

As can be seen from Table 8, tier 1 takes customer satisfaction as the independent variable and customer loyalty as the dependent variable for linear regression analysis. As can be seen from the above table, the model R square value is 0.109, meaning that customer satisfaction can explain 10.9% of the reasons for the

TABLE 4 Questionnaire score table.

Comment	Very dissatisfied	Dissatisfied	General	Satisfied	Very satisfied
Score (S)	0–40	40–60	60–80	80–90	90–100

TABLE 5 Second-level index score.

Second-level indicator	Composite scores	Tangibility	Reliability	Responsiveness	Assurance	Empathy
Expected quality of service	89.9	89.9	90.3	90.1	88	90.1
Perceived quality of service	89.3	89.9	89.7	91	88.9	89.7
Difference value	−0.6	0.00	−0.6	0.9	0.9	−0.5

TABLE 6 Reliability corresponds to the third-level index scores.

Third-level indicator	Expected service quality score	Perceived service quality score	Difference value
Popularity and credibility	89.9	88.1	−1.8
Delivery time commitment	92.2	90	−2.2
Mailing security	91.9	89.5	−2.4
Matching degree between price and service	88.5	89.5	1

TABLE 7 Empathy corresponds to the three-level index score.

Third-level indicator	Expected service quality score	Perceived service quality score	Difference value
Exclusive APP for business handling	90.3	88.4	−1.9
Humanized way of receiving	89.8	89.1	−0.7
Gradient price standard	88.5	89.2	0.7
Easy-to-understand receipts	92.2	89.6	−2.6

change of customer loyalty. The model passed the F-test ($F = 31.916$, $p < 0.05$), that is, customer satisfaction must have an impact on customer loyalty, and the model formula is: customer loyalty = 0.030 + 0.447* customer satisfaction. The final specific analysis shows that: the regression coefficient value of customer satisfaction is 0.447, and presents a significant value ($t = 5.649$, $p = 0.000 < 0.01$), which means that customer satisfaction has a significant positive impact on customer loyalty.

When expected service quality is added on the basis of tier 1, F value changes significantly ($p < 0.05$), which means expected service quality, and perceived service quality has explanatory significance to the model. In addition, R square value increased from 0.109 to 0.237, indicating that expected service quality, perceived service quality can have 12.8% explanatory power to customer loyalty. Specifically, the regression coefficient value of expected service quality was −0.841 and presented a significant value ($t = -6.333$, $p = 0.000 < 0.01$), which means that expected service quality has a significant negative impact on customer loyalty. The regression coefficient of perceived service quality was 0.852 and presented a significant value ($t = 6.522$, $p = 0.000 < 0.01$), indicating that perceived service quality has a significant positive impact on customer loyalty.

After adding five dimensions of service quality on the basis of tier 2, the change of F value presents significant ($p < 0.05$), which means that the addition of five dimensions has explanatory significance to the model. In addition, the value of R square increases from 0.237 to 0.714, which means that the five dimensions of perceived service quality and expected service quality can explain 47.7% of customer loyalty. Specifically, it can be seen that the five dimensions of expected service quality have a negative impact on customer satisfaction, while the five dimensions of perceived service quality have a positive impact on customer loyalty except responsiveness.

According to the regression coefficient, factors with a regression coefficient higher than 0.3 can be taken as the main factors affecting customer loyalty, and it can be concluded that the main factors affecting customer loyalty are reliability of expected service quality and reliability of perceived service quality. Again, the corresponding three-level indicators are taken as independent variables, and the reliability of expected service quality and perceived service quality is taken as dependent variables for regression analysis. The results are shown in Tables 9, 10.

Results and conclusions

Through the above analysis, it can be concluded that the main factors affecting customer satisfaction of city express delivery are

TABLE 8 Results of stratified regression analysis.

		Tier 1: Customer satisfaction→Customer loyalty					Tier 2: Add service quality (expectations/perceptions)					Tier 3: Add five dimensions of service quality (expectation/perception)				
		B	SE	*t*	*p*	*β*	B	SE	*t*	*p*	*β*	B	SE	*t*	*p*	*β*
Customer Satisfaction		0.447	0.079	5.649	0.000	0.331	−0.488	0.162	−3.013	0.003	−0.360	−0.342	0.107	−3.198	0.002	−0.253
Expected quality of service							−0.841	0.133	−6.333	0.000	−1.036	−0.152	0.108	−1.411	0.159	−0.187
Perceived quality of service							0.852	0.131	6.522	0.000	0.961	0.143	0.095	1.513	0.132	0.162
Expected quality of service	Tangibles											−0.275	0.054	−5.144	0.000	−0.341
	Reliability											−0.393	0.042	−9.248	0.000	−0.517
	Responsiveness											−0.108	0.043	−2.522	0.012	−0.141
	Assurance											−0.167	0.045	−3.742	0.000	−0.224
	Empathy											−0.128	0.046	−2.770	0.006	−0.165
Perceived quality of service	Tangibles											0.269	0.055	4.881	0.000	0.312
	Reliability											0.455	0.051	9.010	0.000	0.538
	Responsiveness											0.056	0.047	1.179	0.240	0.065
	Assurance											0.202	0.047	4.308	0.000	0.249
	Empathy											0.155	0.047	3.276	0.001	0.188
R^2		0.109					0.237					0.714				
Adjusted R^2		0.106					0.228					0.699				
F		$F(1,260) = 31.916$, $p = 0.000$					$F(3,258) = 26.703$, $p = 0.000$					$F(13,248) = 47.551$, $p = 0.000$				
$\triangle R^2$		0.109					0.128					0.477				
$\triangle F$		$F(1,260) = 31.916$, $p = 0.000$					$F(2,258) = 21.572$, $p = 0.000$					$F(10,248) = 41.293$, $p = 0.000$				

TABLE 9 Regression results of three-level indicators and expected service quality reliability.

	Unstandardized coefficients		Standardized coefficients	*t*	*p*	VIF	R^2	Adjust R^2	*F*
	B	SE	Beta						
Popularity and credibility	0.278	0.025	0.314	11.257	0.000	1.386	0.856	0.854	$F(4,257) = 381.286$, $p = 0.000$
Delivery time commitment	0.279	0.024	0.339	11.478	0.000	1.553			
Mailing security	0.246	0.029	0.266	8.412	0.000	1.785			
Matching degree between price and service	0.271	0.029	0.282	9.372	0.000	1.615			
D-W				2.091					

in sequence: "Easy-to-understand receipts," "Mailing security," "Delivery time commitment," "Exclusive APP for business handling," "Popularity and credibility," and "Humanized way of receiving." The main factors affecting customer loyalty are in proper order: "Delivery time commitment," "Matching degree between price and service," "Popularity and credibility," and "Mailing security." Thus, the results of the previous research hypothesis can be obtained, as shown in Table 11.

There are various reasons why the test results do not conform to the hypothesis. According to the results of influencing factors, we can know that, compared with the research results of the main influencing factors of customer satisfaction in other industries, "Easy-to-understand receipts" is the most important factor to improve customer satisfaction of city express delivery. The main reason is that the main delivery items of city express delivery are documents and other small parcels. The main service objects are enterprises, companies, schools, government agencies, etc. Simple and clear documents can be used for account reimbursement and information storage more quickly, saving users' time.

By comparing the main influencing factors of customer satisfaction and loyalty, it can be found that "Popularity and credibility," "Delivery time commitment,"

TABLE 10 Regression results of three-level indicators and perceived service quality reliability.

	Unstandardized coefficients		Standardized coefficients	t	p	VIF	R^2	Adjust R^2	F
	B	SE	Beta						
Popularity and credibility	0.211	0.027	0.257	7.965	0.000	1.554	0.828	0.825	F(4,257) = 308.735, p = 0.000
Delivery time commitment	0.294	0.023	0.379	12.647	0.000	1.339			
Mailing security	0.223	0.029	0.244	7.813	0.000	1.450			
Matching degree between price and service	0.286	0.027	0.326	10.700	0.000	1.385			
D-W				2.206					

TABLE 11 Experimental results of the hypothesis.

Hypothesis	Inspection results
H1: Timeliness and security factors under the reliability dimension are the most influential factors that affect the change degree of satisfaction of city express delivery.	Nonsupport
H2: The expected service quality of city express is negatively correlated with customer loyalty.	Support
H3: The perceived service quality of city express is positively correlated with customer loyalty.	support
H4: The most significant factor for improving the satisfaction of city express delivery is also the most effective factor for improving customer loyalty of city express delivery.	Nonsupport

"Mailing security" are common factors affecting customer satisfaction and loyalty, but the importance of these three factors for satisfaction and loyalty is different. The reason for this result is that satisfaction is the evaluation of the service purchased in a single time or a short time, while loyalty is the long-term perception of the enterprise and its services.

The research methods adopted in this paper mainly refer to the satisfaction research methods of other industries. The purpose of this paper is to provide a reference for the research of urban express satisfaction. City express enterprises should combine the actual situation when choosing how to improve customer satisfaction quickly.

In the future, the author's research content will be divided into two aspects. The first is to research the methods to analyze the customer satisfaction of express delivery in the same city. The second is the research on the evaluation system and index of customer satisfaction of city express. In order to expect for the city express industry to put forward more development proposals.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

ZL: methodology, data analysis, and writing-original draft preparation. HD: conceptualization, writing-review and editing, and funding acquisition. LZ: index system and questionnaire design. DE: software and validation. FL: data collection and software. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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An empirical study on the moderating effect of environmental audit on the impact of economic development and ecological environment

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Environmental audit is a new thing. As an important part of national audit, it is an important environmental governance supervision and control mechanism in China, but what is the macro environmental governance effect of environmental audit? Can environmental audit promote regional pollution control? Does environmental audit play a role in regulating the effect of environmental pollution control on the basis of economic development? The research on these issues has great practical and theoretical significance. Through questionnaire, 217 valid data were finally obtained as research samples. Using correlation analysis, partial correlation analysis, full regression, and stepwise regression analysis, on the basis of testing the explanatory power of economic development and environmental audit on ecological environment quality, the paper further tested the impact of the interactive multiplier of environmental audit and economic development on ecological environment quality. The study found that: not only do economic development and environmental auditing each have a significant positive correlation on the quality of the ecological environment; moreover, economic development and environmental auditing interact with each other to influence the ecological environment, and the degree of correlation and influence of environmental auditing on the ecological environment is greater than the degree of correlation and influence of economic development on the ecological environment. Environmental auditing has a significant positive moderating effect on economic development in the process of improving ecological and environmental quality, and on the basis of economic development, environmental auditing by the government has a more significant effect on the improvement of ecological and environmental quality. Studying this problem is not only conducive to guiding the government audit department to take on the role in the ecological environment governance, but also to more effectively control the environmental pollution problem, realizing the cooperation and mutual penetration of the role of government environmental audit in economic development and ecological environment protection policies. It provides reference for future empirical research using micro survey data, and also provides policy suggestions for economic construction, environmental audit, and ecological environment governance in various regions of China, and provides empirical evidence support for contingency theory.

KEYWORDS

moderating effect, questionnaire survey, environmental auditing, economic development, ecological environment

Introduction

High-quality development lies in the harmonious integration of "economic-ecological-social" benefits. The relationship between economic development and the ecological environment is an eternal proposition that needs to be balanced in the development of all countries in the world. The ecological environment is the basis for human survival and development, but the process of economic development is often at the expense of the environment. In recent years, the issue of ecological protection and environmental governance has been a hot topic of global concern. After more than 40 years of reform and opening up, China's economic development has soared to global prominence with brilliant results. But at the same time, there has also been massive consumption of energy resources and serious damage to the ecological environment, some of which is alarming to the eye. Therefore, in order to achieve high-quality development, the importance of protecting the ecological environment and managing ecological pollution cannot be overstated. As an important type of national audit, environmental audit is an important environmental protection tool and a vital "immune system" (Liu, 2015) in the national economic governance system. It is a veritable guardian of the environment, playing a unique role of monitoring, early warning, revealing, and correcting in coordinating the process of dealing with "economic, ecological, and social" conflicts.

Mishan (1967) argues that economic development and the ecological environment are contradictory, and that while economic development enriches the material life of local people, it also degrades the local ecological environment, which in turn constrains further development of the local economy. Parry (1998) found that economic growth can promote the improvement of environmental regulation, and there is no restriction on the improvement limit of ecological environment quality. Shi et al. (2020) found that economic development and the ecological environment are in an intermediate stage of coupling and coordination, with significant spatial and temporal variability, using Chinese regions as a sample. Wang and Liu (2017)constructed an empirical spatial joint cubic equation model for the relationship between economic development, urbanization, and environmental pollution based on 253 regional-level data from 2003 to 2014 across China, and found that economic development and environmental pollution influence each other, and the EKC environmental Kuznets curve is a two-way inverted "U" shape. Zhao et al. (2019) studied the mechanism of economic growth on the improvement of ecological and environmental quality using a spatial panel model based on data from 30 provinces in China between 2003 and 2016, and found that economic development promoted technological progress, which in turn enhanced government environmental governance, thus significantly improved the local ecological and environmental conditions.

In recent years, domestic and international scholars have studied the effects of environmental auditing and environmental governance. Stafford (2006) argues that environmental auditing is an internal review of the results of environmental performance-related behaviors, used to verify compliance with environmental regulations and the effectiveness of environmental management systems. Prajogo et al. (2016) argue that the motivation of environmental auditing is often based on environmental performance improvement to obtain external accreditation and improve public satisfaction in society. Cai et al. (2021) found that audits can identify monitoring priorities, and in areas with high levels of environmental pollution, audits are more intense and government environmental governance is more efficient. In addition, environmental audits can also play a micro governance environmental effect (Yu et al., 2020), improve the level and quality of corporate environmental responsibility information disclosure (Ding and Hu, 2022), and improve corporate environmental protection investment (Cai et al., 2021), which suggests that environmental audits can effectively play a social responsibility regulatory role. Empirical studies of environmental audits have also shown that conducting environmental audits can indeed improve environmental performance; Chen et al. (2022) summarized the findings of the 10th worldwide environmental audit published by the Working Group on Environmental Auditing (WGEA) and concluded that environmental auditing can both protect economic development and be an important part of achieving the "3060" double carbon goal[1]. As a result, countries around the world are placing increasing emphasis on the use of environmental audits to evaluate the "economy-ecology" relationship.

1 In 2020, the Chinese government officially proposed that the country will strive to reach the carbon peak by 2030 and achieve carbon neutrality by 2060, the "3,060" double carbon goal.

However, it can be seen that there are many studies on the relationship between economic development level or government environmental audit and ecological environment quality in the existing literature, but few studies neither integrate the three, nor do they find that government environmental audit is studied as a regulatory variable, thus separating the relationship between government environmental audit and economic development level and ecological environment quality, ignoring the overall effect of the three. As we all know, the governance of the ecological environment has risen to the national strategic level. With the proposal of the "double carbon" goal, the protection and governance of the ecological environment is a major systematic project. The complexity and externality of environmental pollution cannot effectively solve environmental problems based on unipolar forces. In theory, the regions with stronger economic vitality pay more attention to solving the problem of disharmony between economic development and population, resources, environment, and ecology, and also pay more attention to playing the role of environmental audit in pollution prevention. By improving audit technology and strengthening audit power, the audit effect is more obvious, and the performance of environmental governance is more significant (Zhao and Rong, 2022). Wu and Guo (2019) also believed that government environmental audit not only directly affects the construction of the ecological environment, but also indirectly affects the protection and governance of the ecological environment through economic development, so as to further improve the quality of the ecological environment. In view of this, this paper selects 21 regional government audit departments, ecological and environmental departments, natural resources departments, and financial departments in Guangdong Province to conduct a questionnaire survey, and will collect micro-survey data as a research sample to explore the relationship between economic development, environmental audit, and ecological and environmental quality, and further test the moderating effect of environmental audit in the process of regional ecological and environmental quality improvement. It will not only inspects the contingency theory of relevant audit monitoring and management for government audit departments, but also provides a reference for future decisions on economic construction, environmental audits, and ecological management in various regions.

The marginal contribution of this study is as follows: First, compared with the existing research, based on the regulatory effect of environmental audit, this paper tests that environmental audit as a regulatory variable will enhance the positive relationship between economic development and ecological environment quality, which enriches the theoretical research of environmental audit; Second, in previous studies, when examining the influencing factors of ecological environment pollution control performance, they often used macro empirical data, while ignoring micro survey data. This study specifically incorporated micro questionnaire data for empirical testing, expanding the research vision of data; Third, this paper selects 21 regions in Guangdong Province as the research object, which can provide direct evidence support for the government to carry out environmental audit to more effectively govern environmental problems and help achieve the goal of "double carbon."

Limitations of this study

Although the paper is objective, unified and extensive in the questionnaire survey, the results are more accurate. However, the questionnaire is only for Guangdong Province after all, and there are certain limitations in the research area. Whether the research conclusions are valid in other provinces in China still needs to be further verified. In addition, the design of the questions and answers of the questionnaire will largely influence the user's answers, which makes the respondents' answers more limited and may omit some information, making the research design a little biased.

Theoretical analysis and research hypothesis

Mechanistic analysis and research hypothesis of the impact of economic development on the ecological environment

The impact of economic development on ecological environment quality is a combination of indirect and direct effects, and is the result of a game between positive and negative impacts (Zhang and Liang, 2020). There are three main academic findings on the impact of economic development on the ecological environment: the first view is that economic development has a facilitating effect on the ecological environment (Zhao et al., 2019). The second view is that economic development has a hindering effect on the ecological environment (Li and Wei, 2010). A third view is that the impact of economic development on the ecological environment is non-linear (Peng et al., 2020; Ren et al., 2021).This variation in findings may be related to different countries, different stages of development and policy implementation. From the perspective of China's national conditions, in the early stage of economic development, rapid economic growth often takes the cost of sacrificing the environment. At the same time, with the rapid development of technology and the enhancement of the government's environmental awareness, after the rapid economic development, the effect, strength, and funds of environmental governance will also increase, thereby significantly improving the environmental and ecological quality (Wang and Liu, 2017).

As far as Guangdong Province is concerned, in the early stage of economic development, the industrial structure was dominated by the secondary industry, presenting a state of low technology enterprises and low added value. At the same time, the shortage of resources and the sacrifice of the ecological environment restricted the economic development (Zhu and Chen, 2011). Wu and Wu (2011) conducted an empirical study on the relationship between economic development and environmental pollution in the three regions based on the data of Guangfo and Zhaozhou Economic Circle from 1996 to 2008. They found that the impact of economic development in different regions on environmental pollution was significantly different in terms of pollution degree, types of pollutant emissions and emissions. Therefore, previous studies have not reached a consensus conclusion on the relationship between economic development and ecological environment. Based on the above mechanism analysis, the following research hypothesis is proposed.

> *Hypothesis 1*: There is a significant positive correlation between economic development and ecological environment, and economic development can significantly contribute to the improvement of ecological environment quality.

Mechanistic analysis and research hypothesis of the impact of government environmental auditing on the ecological environment

Environmental audit, as a national audit, is an institutional arrangement in the national governance system and can exert governance effects at the consciousness and institutional levels (Liu, 2015). In other words, environmental audits can promote the implementation of environmental protection regulations and establish environmental and ecological awareness in the whole society, for example, Cai et al. (2019)found that regions where environmental audits were implemented had higher awareness of social responsibility and higher levels and quality of corporate environmental responsibility information disclosure. This suggests that government environmental audits enable the government and the public to work together to build an ecological civilization, to comply with environmental guidelines, and to "prevent" ecological degradation. In addition, state audits can contribute to the improvement of systems, institutions, and mechanisms to counteract various "diseases" in economic and social operations (Liu, 2015). The process of implementing environmental audits is also a process of improving, perfecting, and standardizing the relevant environmental protection system. Through the implementation of environmental audits, the unreasonable aspects and loopholes in the rules and regulations can be remedied to regulate and guide the behavior of government departments and officials, so that the deterrent effect of state audits can be brought into play and the ecological and environmental damage can be counteracted. According to the above analysis, environmental audit evaluation can play a role in promoting the construction, protection, and governance of the ecological environment and maintaining the harmonious development of ecological civilization through the functions of prevention, defense, revealing, handling penalties, and making recommendations. Based on the above theoretical analysis, the following research hypothesis is proposed.

> *Hypothesis 2*: There is a significant positive correlation between environmental auditing and the ecological environment, and environmental auditing helps to significantly improve the quality of the ecological environment.

Mechanistic analysis and hypothesis of the impact of environmental auditing on the relationship between economic development and ecological environment quality

According to the public fiduciary responsibility theory, environmental problems are external diseconomies under market economy conditions, and therefore solving environmental problems is transformed into an economic responsibility, with the government being entrusted by the public with the primary responsibility for solving environmental problems (Zhou, 2011). In fact, the fundamental objective of the creation of state audits is to facilitate the full implementation of the government's public fiduciary economic responsibility. In other words, environmental audits can lead the state to fulfil its public fiduciary economic responsibility and solve environmental problems in economic development. At present, environmental audits mainly focus on major resource projects, major environmental issues, and major capital investment (Wang and Zhang, 2019), which involve projects of significant nature and amount. Both major resource projects and major capital investment are important projects to promote China's economic development, to prevent power abuse and improve the efficiency of capital use through economic responsibility audits, and to meet environmental protection needs and improve economic profitability through environmental audits. Environmental auditing can promote sustainable economic development and achieve a green economy by monitoring the abuse of power and the use of funds, which in turn can achieve the function of environmental protection and reduce ecological damage (Liu, 1997). At the same time, the government environmental audit covers a wide range of issues. Environmental protection problems exist in all walks of life. The national resource and environmental protection policies also involve finance, credit, industrial upgrading, and investment and other economic development fields. Therefore, the environmental audit evaluation not only directly affects the construction of the local ecological environment, but also indirectly affects the governance and protection of the local ecological environment through economic development (Wang, 2011; Wu and Guo, 2019). In other words, government environmental audit may play a more active role in monitoring and controlling the impact of economic development on regional ecological environment. Based on the above mechanistic analysis, the following research hypotheses are proposed.

Hypothesis 3: Economic development and environmental auditing interact and jointly influence the ecological environment, and the degree of correlation and influence of environmental auditing on the ecological environment are greater than the degree of correlation and influence of economic development on the ecological environment.

Hypothesis 4: Government environmental auditing has a positive moderating effect on economic development in improving the quality of the ecological environment, and on the basis of economic development, government environmental auditing has a more significant effect on improving the quality of the ecological environment.

Research design

Questionnaire structure design

The basic structure of the questionnaire adopts the questionnaire design method suggested by Davis (1989), in which all the questions of an indicator to be measured are grouped together to facilitate the coherence of the thinking of the respondents when answering the questionnaire. The questionnaire design in this paper, consists of two main parts: the first part is the control variables, i.e., the individual characteristics of the respondents, mainly including gender, nature of work unit, education, and profession, etc., with a total of four question items; the second part focuses closely on the three main variables of economic development level, environmental audit, and ecological environment quality for question design.

In order to ensure the overall reliability and validity of the questionnaire, 62 experts in the fields of environment, audit and finance were asked to pre-survey and test the reliability and validity of the pre-survey questionnaire, which resulted in a formal questionnaire with five questions for each variable, 15 compulsory questions, and one open-ended question. Sample questions include "How does your family's economic situation compare with that of the past 10 years," "What do you think of the current material standard of living," "How effective is the environmental audit work in your area in reducing pollution in enterprises?" "How satisfied you are with the construction of ecological civilization and the improvement of ecological environment in your area," etc. In this paper, all the compulsory questions of the three main variables in the questionnaire were judged using a five-point Likert-type scale, with scores ranging from 1 to 5, indicating very poor, poor, fair, good, and very good in that order, with higher scores being more desirable. The structure and reliability of the questionnaire are shown in Table 1.

Questionnaire distribution and return

In order to control for possible effects of differences in the variables at the regional and industry levels where the sample is located, the research sample for this paper was drawn from 21 regional government departments in Guangdong Province, such as audit, environmental protection, natural resources, and finance, which are closely related to this topic, and the survey period was from March 1 to March 20, 2022. In order to make the sample more representative and scientific, the inclusion and exclusion criteria of the dataset in this study are as follows.

The inclusion criteria of the dataset

The samples are all permanent residents with Guangdong household registration on December 31, 2021; the samples were collected from 21 regions in Guangdong Province, including Guangzhou, Shenzhen, Foshan, Dongguan, Huizhou, Zhaoqing, Zhongshan, Maoming, Zhanjiang, Jiangmen, Zhuhai, Shantou, Chaozhou, Jieyang, Shanwei, Shaoguan, Qingyuan, Meizhou, Heyuan, Yangjiang, and Yunfu. The sample is from government audit, environmental protection, natural resources, financial departments, typical enterprises, and institutions who have worked for 3 years or more, and some community residents' representatives. According to the number of permanent residents in each region by the end of 2021, the total number of samples is determined by the probability sampling method combining stratified sampling and systematic sampling.

The exclusion criteria of the dataset

Non Guangdong household registration; among those who have worked in government audit, environmental protection, natural resources, financial departments, typical enterprises, and institutions for 3 years or more, those who fail the year-end assessment; the community representatives are under 25 years old.

In the questionnaire guide, the respondent was told that "This questionnaire is anonymous, any information you have provided is used for academic analysis only, does not involve individual discussions, and the content is absolutely confidential. Please fill in the answer truthfully to ensure the authenticity and scientific

TABLE 1 Questionnaire structure and reliability and validity test.

Variables and codes	Topic options Number and code	Type	Reliability Cronbach's α	Validity Kaiser-Meyer-Olkin	Role
Individual Respondent Characteristics	4	Non-scale	0.874(Overall)	0.822(Overall)	Control variables
Economic development (*"rjgdp"*)	*R1*, *R2*, *R3*, *R4*, and *R5*	scale	0.849	0.744	Regression analysis
Environmental Audit (*"eaud"*)	*A1*, *A2*, *A3*, *A4*, and *A5*	scale	0.928	0.879	Regression analysis
Ecological environment quality (*"eqi"*)	*E1*, *E2*, *E3*, *E4*, and *E5*	scale	0.919	0.842	Regression analysis

nature of the results." The questionnaires were distributed and collected by the researcher himself, with explanations given prior to distribution. In addition, based on the following points, the sample will be used and participants' answers will be excluded from the analysis.

Fill in incomplete or unclear questionnaires; questionnaires that take too long to answer (more than 8 min); questionnaires with too short answer time (less than 2 min); and an questionnaire with multiple options appears.

A total of 246 questionnaires were distributed in this study, through the above exclusion, we finally obtained 217 valid questionnaires, with an effective rate of 92.7%, and their individual structural characteristics are shown in Table 2.

Empirical analysis of survey data

Descriptive statistics and correlation analysis

Table 3 below reflects the descriptive statistics and correlation analysis of the overall survey values of *"rjgdp," "eaud,"* and *"eqi,"* and by two-tailed test, it is found that the correlation coefficients between *"rjgdp"* and *"eaud," "eaud"* and *"eqi,"* and *"rjgdp"* and *"eqi"* are 0.803, 0.856, and 0.772, respectively, showing a significant positive correlation at the 0.01 level, initially indicating that *"rjgdp"* and *"eaud"* have a facilitating effect on the improvement of *"eqi,"* but the degree of influence between the variables cannot be judged based on the degree of correlation alone, and the experience of causality must be determined by regression analysis.

As can be seen from Table 3, when evaluating the current level of economic development, the status of environmental auditing and the basic status of ecological and environmental quality in Guangdong Province, the mean scores are relatively high, all of them are above 3.5 (median 3), which indicates that the respondents are satisfied with the current level of economic development, the status of environmental auditing, and the overall evaluation of ecological and environmental quality in Guangdong Province. Figure 1 shows the mean and standard deviation of the three variables of economic development, environmental audit, and ecological environment in Guangdong Province. The figure shows that the average score of economic development level, environmental audit status, and ecological environment quality in Guangdong Province is above 3.5. The score is high and the standard deviation is small, indicating that the interviewees have a high evaluation of Guangdong Province. The more they agree with Guangdong Provincial Government in terms of economic development, environmental audit, and ecological environment

TABLE 2 Analysis of individual structural characteristics of the questionnaire sample.

Item	Sample distribution	Number of samples (pcs)	Percentage (%)	Total (pcs)
Gender	Male	94	43.3	217
	Female	123	56.7	
Nature of work unit	Government audit department	90	41.5	217
	Government environmental protection department	43	19.8	
	Natural resources department	27	12.4	
	Finance department	22	10.1	
	Enterprises and institutions	19	8.8	
	Other	16	7.4	
Education	High school and above	2	0.9	217
	College	32	14.7	
	Bachelor's degree	143	65.9	
	Master's degree and above	40	18.4	
major	Accounting, auditing and other management	75	34.6	217
	Environmental protection, such as ecology and environment	30	13.8	
	Finance, economics, etc.	67	30.9	
	Other majors	45	20.7	

TABLE 3 Correlation analysis of the overall data for the three variables of economic development, environmental audit, and ecology.

Variable	Number of samples	Average value	Standard Deviation (SD)	*rjgdp*	*eaud*	*eqi*
rjgdp	217	3.86	0.7705	1		
eaud	217	3.92	0.7332	0.803***	1	
eqi	217	3.94	0.7017	0.772***	0.856***	1

***Significant correlation at the 0.01 level (two-tailed).

governance. Especially, the respondents think that the ecological and environmental quality has been greatly improved through vigorously carrying out environmental audits and focusing on environmental pollution control, which is also in line with the actual situation of Guangdong Province.

Partial correlation analysis

In the multivariate correlation analysis, due to the influence of other variables, the correlation coefficient of two variables only reflects the nature of the two variables on the surface, often does not truly reflect the degree of linear correlation between variables, and may even give people the illusion of correlation. Therefore, in some cases, a simple two variable correlation coefficient is not an essential statistic to describe the correlation. When other variables are fixed, that is, after they are controlled, the correlation between any two given variables is called partial correlation coefficient. Partial correlation analysis, also known as net correlation analysis, is used to analyze the degree of linear correlation between two variables under the control of the linear influence of other variables. The tool used is partial correlation coefficient. Partial correlation analysis is used to calculate the partial correlation coefficient between variables, so as to more accurately judge the correlation between variables and the degree of correlation. In view of this, this study uses partial correlation to analyze the correlation and degree between economic development, environmental audit and ecological environment.

1. Controlled for the partial correlation analysis of "*rjgdp*" variables, as shown in Table 4.
2. Controlled for biased correlation analysis of "*eaud*" variables, as shown in Table 5.

The results of the partial correlation analysis in Tables 4, 5 above show that when "*rjgdp*" is controlled for "*eaud*" and "*eqi*," the positive correlation between "*eaud*" and "*eqi*" decreases from $r = 0.856$ to $r = 0.622$, with a reduction of 0.234 in the correlation coefficient; when "*eaud*" is controlled for "*rjgdp*" and "*eqi*," the positive correlation between "*rjgdp*" and "*eqi*" also decreases from $r = 0.772$ to $r = 0.275$, with a surprising reduction of 0.497 in the correlation coefficient. This indicates that economic development and environmental auditing interact with each other and jointly influence the improvement of ecological and environmental quality; on the other hand, it also tentatively confirms that environmental auditing has a greater effect on the improvement

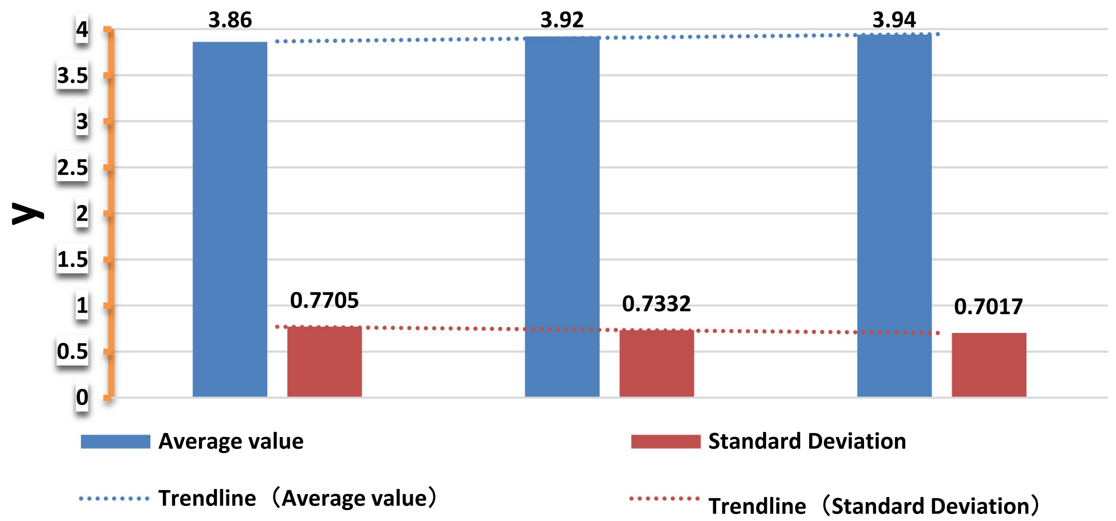

FIGURE 1
Means and standard deviations of the three variables of economic development, environmental audit, and ecological environment.

TABLE 4 Partial correlation analysis of economic development on environmental audit and ecological environment.

Control Variable	Relevant variable	Item	*eaud*	*eqi*
rjgdp	*eaud*	Correlation	1.000	0.622
		Significance (two-tailed)	.	0.000
		(number of) Degrees of freedom (physics and statistics)	0	214
	eqi	Correlation	0.622	1.000
		Significance (two-tailed)	0.000	.
		(number of) Degrees of freedom (physics and statistics)	214	0

TABLE 5 Partial correlation analysis of environmental audit on economic development and ecological environment.

Control Variable	Relevant variable	Item	rjgdp	eqi
eaud	*rjgdp*	Correlation	1.000	0.275
		Significance (two-tailed)	.	0.000
		(number of) Degrees of freedom (physics and statistics)	0	214
	eqi	Correlation	0.275	1.000
		Significance (two-tailed)	0.000	.
		(number of) Degrees of freedom (physics and statistics)	214	0

of ecological and environmental quality, which tentatively verifies hypothesis 3. However, the partial correlation analysis only shows the correlation between variables and the degree of correlation, but does not determine whether there is a real causality between variables.

Full regression analysis

In the regression analysis of data, attention should be paid to whether there are multicollinearity and autocorrelation problems. The multiple collinearity of measure is tested by variance inflation factor (VIF), and the autocorrelation of measure is tested by Debbie Watson test (D-W).

Variance inflation factor (VIF) is a measure of the severity of multiple (multiple) collinearity in multiple linear regression models. It represents the ratio between the variance of the regression coefficient estimator and the variance when the independent variables are not linearly correlated. Generally, if the VIF is greater than 10, it is considered that it has a high multicollinearity and the model does not meet the requirements.

Durbin Watson (D-W) is a very effective method to test whether the error items in the model have autocorrelation. The parameter of this test is D, and its value range is (0,4). $\underline{D}=2$ indicates that residuals are independent; $D<2$ indicates positive correlation between residuals; $D>2$ shows that the residuals are negatively correlated. According to experience, when the D value is between 1.5 and 2.5, there is no significant autocorrelation problem, and the model is effective (Shen, 2005). In this study, VIF and D-W tests are used to measure the collinearity of survey data.

According to the results of the full regression analysis in Table 6, the "*rjgdp*" and *"eaud"* regression coefficients and constant terms reached significance at the 0.01 level and had a direct effect on *"eqi,"* being introduced into the regression equation. In the regression results, the Fr value is 325.026,significant at the 0.01 level, indicating a very good regression effect, and the correlation coefficient is equal to 0.867, indicating a strong correlation between the independent and dependent variables. R^2 is equal to 0.752, indicating that the independent variable, environmental audit, explains 75.2% of the variability of the dependent variable. The variance inflation factor test (VIF = 2.813) and the Durbin-Watson test (D-W = 1.786) index test, both within the standard range, indicate that there is no autocorrelation between the residuals of the independent variables and there is no problem of multicollinearity. In particular, the regression results of *"eaud"* on *"eqi"* show that the significance level is 1%, the regression system B = 0.635, and t value = 11.63. The regression results of "*rjgdp*" on *"eqi"* show that although the significance level is also 1%, the regression system B = 0.218, and t value = 4.19, it is obviously inferior to the former. Combining the above information, analysis with the full regression method can reveal that both economic development and environmental auditing have a significant causal influence on ecological environment. Moreover, the correlation and causal impact of environmental audit on the ecological environment are greater than the correlation and causal impact of economic development on the ecological environment. The above analysis further supports the verification of Hypotheses 1–3.

Stepwise regression analysis and results

To test hypothesis 3, the moderating effect of *"eaud"* on the impact of *"rjgdp"* and *"eqi,"* i.e., on the basis of economic development, environmental auditing is more likely to promote the improvement of ecological and environmental quality. In this study, the multivariate stepwise hierarchical regression method (Stepwise) was used to examine the validation, the valid sample size of the questionnaire was 217, and the results of the regression analysis are shown in Table 7.

Table 7 above reports the results of microscopic survey data and stepwise hierarchical regression. The last two rows of the table reflect the VIF factor and D-W index tests of the variables in each model. It is clear from the table that all the index values are within the standard control values and the results are satisfactory, indicating that there is no multicollinearity in the models and no autocorrelation between the residuals of the variables. The significance levels of all R^2 F-values are below 0.001, indicating that the overall effect of all regression models is relatively satisfactory and suitable for causality testing.

In the first step, the control variables, i.e., individual characteristics variables, were put in to try to eliminate the influence of some disturbances, and the control variables explained a total of 14.9% ($F = 9.262$, $p < 0.001$) of the variance of ecological environment quality (*eqi*). Since individual characteristics often reflect the influence of multiple factors at the

TABLE 6 Table of results of full regression analysis of economic development and environmental audit on ecological environmental.

Regression variable	R	R^2	R^2 (Adjusted)	F_r	B	B (Standard)	t	VIF	D-W
eqi	0.867(a)	0.752	0.750	325.026***				2.813	1.786
Constant term					0.609		4.583***		
rjgdp					0.218	0.239	4.190***		
eaud					0.635	0.664	11.630***		

***Significant correlation at the 0.01 level (two-tailed).

TABLE 7 Stepwise regression analysis results of environmental audit on the relationship between economic development and ecological environment quality.

Dependent variable → independent variable ↓	β	*eqi* Model 1	Model 2	Model 3	Model 4
Step 1: control variables					
1. Gender		0.041	0.019	0.038	0.029
2. Nature of work unit		−0.255***	−0.102**	−0.071**	−0.076**
3. Education		0.030	−0.023	−0.111***	−0.101**
4. Major		0.297***	0.070*	0.048	0.041
Step 2: Explanatory variables					
5. rjgdp			0.732***	0.193***	0.196***
Step 3: moderating variables					
6. eaud				0.696***	0.686***
Step 4: Moderating variables * explanatory variables					
7. rjgdp*eaud					0.067**
F-value		9.262	65.885	118.596	103.616
P-value		0.000	0.000	0.000	0.000
R^2 value		0.149	0.610	0.766	0.776
ΔR^2 value		0.149	0.461	0.156	0.010
VIF value		1.079	1.163	2.984	1.070
D-W value		1.523	1.936	1.803	1.769

*$p<0.1$; **$p<0.05$; and ***$p<0.01$.

same time, the meaning of regression coefficients of individual characteristics variables is not derived in this paper.

In the second step, the explanatory variable, namely economic development (*rjgdp*), was put into the regression equation. Results Model 2 shows that there is a significant positive causal relationship between economic development (rjgdp) and ecological environment quality (eqi) at the level of 1% (β = 0.732, $p<0.01$), The resulting model increased the explanatory power of the variance of ecological environmental quality (*eqi*) by 41.6% ($F=65.855$, $p<0.01$), which indicates that the level of economic development (*rjgdp*) has a significant cause explanatory power on the improvement of ecological environmental quality (*eqi*), which further supports the previous model hypothesis 1, that economic development has a significant effect on the improvement of ecological quality, all else being equal.

In order to filter out the possible power of environmental audit (*eaud*) itself on the improvement of ecological environment quality (*eqi*) before testing the moderating effect, this paper put environmental audit (*eaud*) into the regression equation in the third step, Results Model 3 found that environmental audit (*eaud*) had a significant causal relationship with ecological environment quality (*eqi*) at the level of 1%(β = 0.696, $p<0.01$), and found that the explanatory power of environmental audit (*eaud*) variable on the improvement of ecological environment quality (*eqi*) increased by 15.6% ($F=118.596$, $p<0.01$), indicating that environmental audit (*eaud*) by itself has a 15.6% degree of influence on the relationship between economic development level (*rjgdp*) and ecological environmental quality (*eqi*), which also further supports the previous model hypothesis 2, that environmental audit has a significant causal influence on the improvement of ecological environmental quality, all else being equal.

To verify whether there is a moderating effect of environmental audit (*eaud*) between the level of economic development (*rjgdp*) and ecological environmental quality (*eqi*), the fourth step puts the decentered interaction product term (*rjgdp**eaud*) of government environmental audit (*eaud*) and the level of economic development (*rjgdp*) into the regression equation, The results show that the entry of these variables makes rjgdp*eaud in model 4 have a significant causal relationship with ecological environment quality (*eqi*) at the level of 1%(β = 0.067, $p<0.01$), and it is found that the entry of this set of variables increases the model's explanatory power of environmental audit (*eaud*) and ecological environment quality (*eqi*) by 1.0% ($F=103.616$, $p<0.05$), i.e., the decentered interaction product term (*rjgdp**eaud*) of environmental audit (*eaud*) and economic development level (*rjgdp*), in addition to excluding the effects of various other variables and their own existence, can also have a significant effect on ecological environmental quality (*eqi*) variance by a significant increase of 1.0% in explanatory power, indicating a moderating effect of environmental audits (*eaud*), which verifies the previous model hypothesis 4, i.e., the moderating effect of environmental audits on the impact of economic development and ecological environment.

The regression coefficient β = 0.067 for the interaction product of economic development level and decentered environmental audits was found to be positive, indicating that environmental audits play a positive moderating effect in the relationship between economic development level and ecological environment quality, implying that the higher the economic development level, the better the ecological environment quality improvement for those regions with more environmental audits. On the contrary, for those regions with less environmental audits, the effect of ecological environment improvement is poorer (Figure 2).

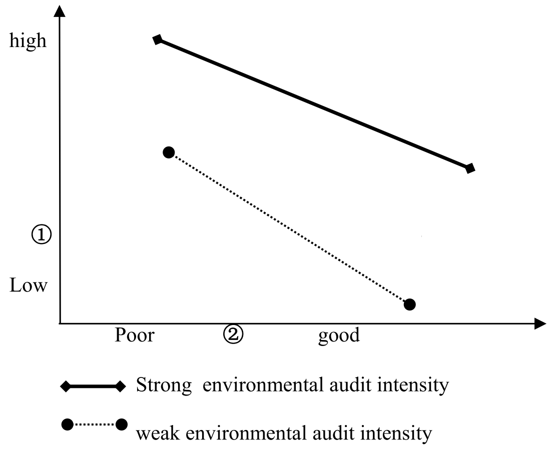

FIGURE 2
Economic development and ecological environment: the moderating effect of environmental audits. ① represents the level of economic development; ② represents the quality of ecological environment.

Conclusion

This paper empirically examines the relationship between economic development, environmental auditing, and ecological environment and their impacts using micro-survey data from 21 regions in Guangdong Province.

First, there is a significant positive correlation between economic development and ecological environment, and economic development can significantly contribute to the improvement of ecological environment quality. Therefore, governments at all levels can get rid of the difficult situation that economic development interferes with ecological and environmental protection work and achieve a win-win situation of economic growth and ecological and environmental quality improvement.

Second, there is a significant positive correlation between environmental auditing and ecological environment, and environmental auditing can help significantly improve the quality of ecological environment. Therefore, governments at all levels can play the functions of environmental auditing to monitor, warn, reveal, and correct deviations, and contribute to environmental governance with its unique characteristics of authority, independence, professionalism, comprehensiveness, and sensitivity to "cure existing diseases and prevent future diseases." Then, in the process of promoting economic development, governments at all levels must increase the supply of environmental audits, optimize the allocation of audit resources, and promote full coverage of environmental audits to meet the current "double carbon" background of environmental auditing tasks and national requirements for full coverage of resource and environmental audits.

Third, environmental auditing has a positive moderating effect on economic development in improving ecological and environmental quality, and it is more significant on the basis of economic development. In the empirical test, it is also found that environmental auditing is a positive moderating effect in the relationship between the level of economic development and ecological environment quality, indicating that under the same level of economic development, for those regions where environmental auditing is carried out more intensely, it is more likely to improve ecological environment quality. Therefore, governments at all levels need to further follow the trend and actively carry out environmental audits to give full play to the important role of environmental audits and the active role of environmental governance subjects, so as to escort the realization of the "double carbon" goal and ultimately promote regional high-quality development.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

MX contributed to all the work of this study, which includes the research plan, conduct, survey design, data collection, data analysis, and report writing.

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Conflict of interest

The author declares that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

Publisher's note

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The influence of uncertain expectations on Chinese rural residents' consumer behavior decisions: Theoretical analysis and empirical test

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Economic uncertainty will result in consumers' unstable environment expectations, thus affecting household consumption decisions. The paper established a consumption model though using the cointegration theory and ECM model, and used the annual data from 2002 to 2021 to examine the influence of uncertain expectations on the consumption behavior of rural residents in China. The research results show that consumers' income, consumption, consumption habits liquidity constraints and precautionary savings jointly produce the feelings of uncertainty, which will lead to rural consumers' uncertain expectations. Uncertain expectations will not only lead to rural residents the prudent consumption behavior of residents, but also lead to the lack of confidence of residents, forming phased consumption characteristics. Combining the results of the empirical analysis, this paper gives suggestions to promote rural consumption from the perspective of increasing rural residents' income, reforming the income distribution system, improving the rural financial system, and reinforcing the construction of rural consumption infrastructure.

KEYWORDS

uncertain expectations, consumption behavior decision, precautionary saving, rural residents, empirical analysis

Introduction

The world is now undergoing major changes. As the pandemic continuously impedes global economic development, the global economy is faced with great uncertainties. Economic uncertainties will result in consumers' unstable environment expectations, thus affecting enterprises' investment and financing decisions and household consumption decisions. Uncertainties constitute ineluctable objective reality during economic development. Normally, certain economic variables lead to uncertainties; and necessary connections can be seen between the current changes in external environment and uncertainties. Consumer behaviors are affected by uncertainties, as consumers with uncertain expectations are more irrational. Such irrational expectations will not only lead to residents' caution about consumption, motivate their precautionary savings, thus reduce their consumption, but also undermine their confidence so that risk-averse rational consumers attempt to seek "certainties" in an uncertain environment. On this basis, this paper will explain how uncertainties induce residents' irrational expectations and further influence residents' consumption, and conduct an empirical test on this hypothesis by making use of the econometric model.

Literature review

Early consumer theories were established based on certain conditions. In The General Theory of Employment, Interest, and Money, Keynes (1936) put forward the absolute income hypothesis, which believed in a stable functional relationship between current consumption and current income, i.e., the level of consumption was determined by the absolute income and marginal propensity to consume decreases progressively. Duesenberry (1949) held that consumption depended on people's relative income instead of current absolute income, and consumption showed demonstration effect, irreversibility, ratchet effect and recovery effect. According to the permanent income hypothesis of Friedman (1956), people made consumption plans based on their permanent income, i.e., income they could obtain for a long time, but not their short-term income. Modigliani (1955) raised the life cycle hypothesis, which thought that everyone arranged consumption according to the expected income in his/her whole life, saved money when young and used savings when old, to achieve smooth consumption in his/her whole life. These hypotheses had stable and good expectations for future income and believed that consumers had certain expectations for the future; however, as a matter of fact, future income is uncertain. Only when uncertainties have been taken into consideration can we truly explain consumer behaviors.

Being an objective phenomenon in the development of human society, uncertainties exert influence on social and economic development and human life behaviors all the time. Frank (1921) defined an uncertainty as an unforeseen and unmeasurable change. It was Leland who first incorporated uncertain factors in the consumption model. He believed that after uncertainties had been introduced, consumers' savings not only enabled the equal distribution of wealth throughout the life cycle, but also prepared consumers for any uncertain incident as precautionary savings. Hall and Mishkin (1982) proposed the Random Walking Hypothesis by introducing the rational expectation method into the life cycle and permanent income hypothesis. This hypothesis considered that consumers' consumption trajectory was a course of random walking by which consumers sought maximum utility based on rational expectations (Hall and Mishkin, 1982). During the demonstration of the random walking hypothesis, Flavin (1997) advanced the Excess Sensitivity theory of consumption, which discovered the significant positive correlation between consumption and foreseen labor income (Flavin, 1997). Campbell and Deaton (1989) raised the Excess Smoothness of consumption, pointing out the great difference between actual consumption changes and theoretical estimates (Deaton, 1991). According to the liquidity constraint theory put forward by Deaton, Zeldes, et al., consumers were subject to constraints as they could not obtain loans from financial or non-financial institutions and individuals to satisfy their consumption needs in case of any uncertainty. Deaton (1991) (Carroll, 1994) and Carroll (1994) proposed the buffer stock savings hypothesis by combining the precautionary savings hypothesis and liquidity constraint theory, which considered savings as a kind of buffer stock that aimed to maintain normal consumption in a bad situation or increase consumption in a good situation (Dynan, 1993).

In the 21st century, scholars have conducted many residents' consumer behaviors under the uncertain environment. Johan (2001) studied on the impact of preventive savings on Swedish consumption (Johan, 2001). Scotti (2016) using surprise and uncertainty indexes to study on the real-time aggregation of real-activity macro surprises (Scotti, 2016). Gangling Cao, Guangsheng Wan. (2016) Using the survey data from 26 provinces and the special survey data of migrant workers' household consumption in Shanghai, this paper makes an exploratory study on the changes in the consumption structure of migrant workers' families at different stages of their life cycle. The results show that the traditional family life cycle model cannot show the different changes in the consumption structure of migrant workers' families at different stages of their life cycle (Gangling and Guangsheng, 2016). Liu and Zhang (2018) researched on residents' consumer behaviors between 1978 and 2012. The author measured the uncertainty of expected income and consumption expenditure using deviation adjustment rate and conditional variance, and found that uncertainties would impede the improvement of residents' consumption. Targeting the "spillover" of domestic consumer demand, (Liu and Zhang, 2018). Park J S, Suh D. (2019) discussed uncertainty and household portfolio choice using evidence from South Korea. Bahmani-Oskooee and Maki Nayeri (2020) using the data of G7 countries, discusses the relationship between policy uncertainty and consumption in the case of policy asymmetry (Park and Suh, 2019). Wei and Yang (2017) focused on residents' consumption upgrading, established the theoretical analysis framework "income structure – social security – residents' consumption," revealed the basic features of Chinese residents' consumption between 2003 and 2014 according to the elastic calculation results of income in the ELES model, and tested the theoretical framework by making use of the dynamic regression panel data model. With the outbreak of COVID-19, The impact of the epidemic on consumer has gradually deepened, scholars have discussed the impact of the COVID-19 epidemic on consumers from various perspectives. Omar Nor et al. (2021)

discusses the panic buying behavior of consumers during the COVID-19: research the impact of uncertainty, severity cognition, scarcity cognition and anxiety (Omar Nor et al., 2021).

To sum up, economists have discussed the changes in residents' consumer behavior decisions in the context of uncertainties from different perspectives, and believed that consumer behaviors would be subject to the influence of uncertain factors in the future and become irrational. Hence, further studies shall be conducted on how the uncertain expectations affect residents' consumer behavior, and, especially considering the impact of the current pandemic, on how to adopt policy measures to reduce residents' uncertain feelings and promote rural residents' consumption, thus to boost economic growth (Omar Nor et al., 2021). Therefore, this paper will discuss how rural residents' irrational expectations that result from uncertainties affect residents' consumption decisions, conduct an empirical test on the theory based on the econometric model, and finally propose policy suggestions (Mankiw and Stephen, 1991).

Hypothesis and proposition

Causes of Chinese rural residents' uncertainty about consumption

Along with the rapid development of China's economy and continuous urbanization since the Reform and Opening Up, rural residents embrace increasing employment opportunities and rapidly growing income. From 2002 to 2021, Chinese rural residents' *per capita* disposable income had increased from CNY 2,529 to 18,931 by 6.49 times. During this period, residents had certain expectations for income growth in the future, and believed that income would increase over time. However, seeing the continuation of the pandemic, geopolitical conflict and the general recession of global economy, residents are feeling more uncertain about the future, while these uncertain feelings aggravate the uncertainties of income, expenditure and price (XiaoHua et al., 2016).

Rural residents' income Is uncertain

1. Rural residents' wage income is uncertain.

Along with the economic development and accelerated urbanization in China in recent years, more urban jobs are provided to peasants. An increasing number of peasants work in cities, forming the new group of migrant workers. Wage income has become the major source of income of rural residents. However, migrant workers' income is uncertain. Migrant workers cannot enjoy the welfare and social security system for urban residents due to the dual household registration system in China; the income and benefits of migrant workers from urban jobs are unstable; and they may also suffer from wage arrears due to their average cultural quality and less stable jobs. Therefore, compared with urban residents, migrant workers' wage income is more uncertain (Longfei and Jun, 2019).

2. Production and operating income is vulnerable to climate changes and market risks, and is therefore uncertain.

The uncertainties of production and operating income mainly come from natural risks and market risks of agriculture. First, as agricultural producers, Chinese rural residents lack the ability to resist natural disasters. Bahmani-Oskooee and Maki Nayeri (2020) Since agriculture is significantly influenced by the climate, rural residents' income is extremely unstable, with their income increasing in a good year and decreasing in a bad year.

Generally, agriculture is seriously affected by natural disasters. From 2010 to 2021, the rural disaster-stricken area ranged between 10,000 and 40,000 thousand hectares in China, which was above 20,000 thousand hectares before 2016, and gradually decreased in recent years until 11,739 thousand hectares in 2021 (Figure 1).

China's agriculture suffers from such natural disasters as floods, droughts, wind hail, and freezing, among which floods and droughts make the major natural disasters faced by Chinese rural areas that hit a large area, jointly occupying 85% of the total disaster-stricken area. Wind hail and freezing affect a smaller area, and produce only 15% of the total disaster-stricken area. As a result of frequent occurrence of agricultural natural disasters, residents' current income has been lowered, and peasants' income becomes uncertain (Figure 2).

3. Rural residents also encounter many market risks as operators. Agriculture in a market economy is characterized by the low elasticity of the demand price of agricultural products in both the short and long run, as well as the low elasticity of the supply price in the short run but relatively high elasticity in the long run (Dvornak and Kohler, 2007). Therefore, the supply elasticity of agricultural products is greater than the demand elasticity, so agricultural products are always in the buyer's market, and rural residents have no bargaining power during the supply and sales of agricultural products.
4. Transfer income is temporary income that cannot relieve consumers' uncertain feelings.

In recent years, rural residents' transfer income has grown at an accelerated speed. Transfer income mainly refers to various transfer payments from the government, government-sponsored institutions and social groups to households and the income transfer among households, including subsidies such as family planning subsidies, subsistence allowances, allowances for poverty-stricken people, endowment insurance and ecological compensation; the pension, social relief and assistance, disaster-relief funds, regular donations and compensations transferred

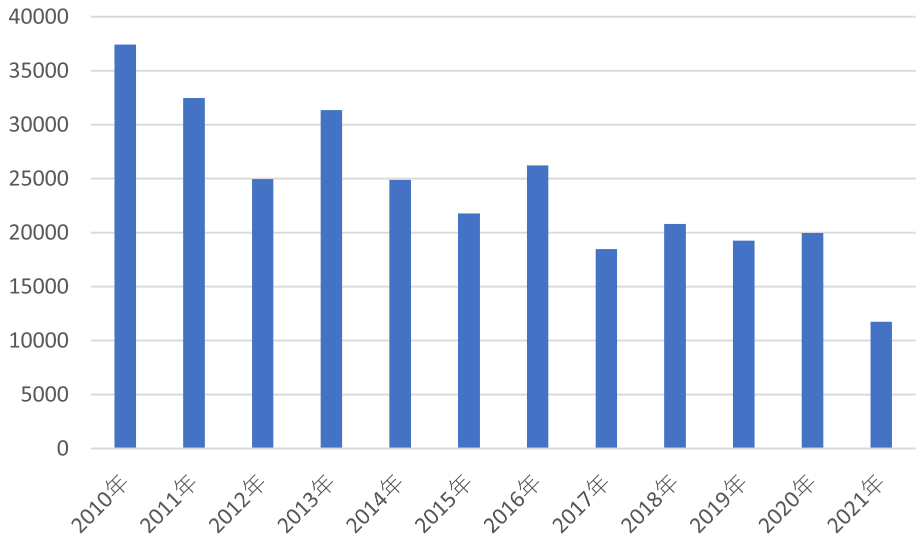

FIGURE 1
Change in rural disaster-stricken area in china between 2010 and 2021.

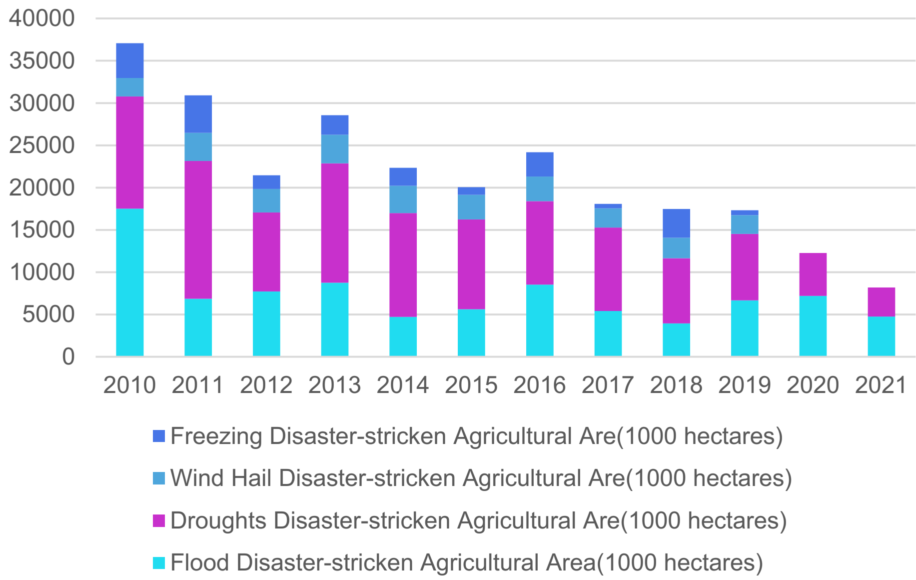

FIGURE 2
Composition of disaster-stricken agricultural area in China.

from the government, non-administrative institutions and social groups to rural households; as well as alimony income, regular donations and compensations, and the income from non-resident members registered in rural areas but working outside (Easaw et al., 2005). However, transfer income is temporary income. According to Milton Friedman's permanent income hypothesis, consumers' income is divided into permanent income and temporary income; and permanent income is the regular and stable income, while temporary income is unexpected and unstable income. What decides people's consumption expenditure is their permanent and long-term income instead of their short-term disposable income. Transfer income exerts no influence on residents' income expectation since it is not permanent income.

Rural residents' consumption expenditure is uncertain

As rural residents are producers and consumers at the same time, their consumption is divided into two parts, that is the productive consumption to purchase the means of production and living consumption to buy the means of subsistence. These two kinds of consumption show a trade-off correlation given the fixed residents' income, and often mix together. When the price of the means of agricultural production increases, productive consumption has the crowding-out effect on living consumption (Nadenichek, 2007).

From the perspective of living consumption, various expenditures that were originally borne by enterprises or the government become real expenditures of individuals along with the reform of housing, education and medical system, and such expenditures are subject to numerous uncertainties over time and severely affect residents' consumption. In recent years, the health expenditures of rural residents have grown rapidly from *per capita* CNY 107 in 2002 to 1,580 in 2021 by 13.76 times. The main reason lies in the imperfect rural social security system by which residents have to spend a lot on illness treatment. The *per capita* health expenditure in rural areas is higher than that of urban residents, mainly due to the single form, narrow coverage, low socialization, weak supportability and unstable fund sources of rural social security system as well as the imperfect security law. Residential consumption expenditure has grown at a high speed in recent years, from *per capita* CNY 326 in 2002 to 3,315 in 2021, and the proportion of residential consumption in *per capita* consumption has fluctuated around 20%. Housing is a very important means of production and subsistence for rural residents, who have rigid demand on houses. To increase income, rural residents may build house of the demand and increase the housing expenditure, resulting in the reduction of other consumption expenditures.

Rural residents' phased consumption derived from traditional culture exerts significant influence on rural residents' uncertain feelings

According to the life cycle hypothesis, rational consumers with certain expectations will arrange for their lifetime consumption based on their lifetime labor income and property income, with the hope of achieving stable consumption in every period of life, to make their lifetime consumption expenditure equal to the sum of their labor income and property income (Segal et al., 2015). Chinese rural residents are exposed to phased consumption rather than smooth consumption. For upcoming important events, consumers will make precautionary savings several years in advance to cope with uncertain events. Such important events include marriage, having a baby, child's education, elderly care and any major disease that may occur at any time. They will make savings for a period of time before these events, when their consumption is less than their income; and when these big events come, they will use the savings for consumption, so in this period, consumption overtakes income (Baker et al., 2016). Therefore, rural residents often have to make a choice between consumption and savings with their current income, which constitute phased consumption showing a trade-off correlation. In the light of the above hypothesis, consumption arrangements of Chinese rural residents can be divided into 10 phases, including five phases of savings and five of consumption, with each varying in the length of time due to different consumption goals. These 10 phases are, respectively, savings before marriage, consumption for marriage, savings for consumer staples, purchase and construction of fixed assets, savings for children education, consumption for children education, savings for children marriage, consumption for children marriage, savings for elderly and medical care, and consumption for elderly care. It can be seen than rural residents' whole life can be divided into different phases with different characteristics (Dimab et al., 2017).

To sum up, rural residents in China are faced with greater uncertainties resulting from uncertain income and expenditure and consumption habits. In this case, rural residents have irrational expectations for future income and expenditure rather than rational expectations described by Western scholars (Guojin et al., 2018). As future expenditure is not yet certain, consumers lack necessary information on external environment, particularly the future economic information that can hardly be obtained, and the world is exposed to continuous pandemic, geopolitical conflicts, severe economic regression and the domination of de-globalization thoughts, rational economic subjects attempt to expand their "vision" to the far future and achieve utility maximization. Under these circumstances, consumers will necessarily sacrifice consumption for their feelings of certainty about the future, which will be reflected by low consumption, increase of precautionary savings and residents' phased consumption.

Hypothesis

The uncertainty of external environment gives rise to consumers' uncertain expectations, and consumers' such irrational expectations on future income, market and price will further influence residents' consumer decisions. In order to completely explain rural residents' consumption in this specific historical period, the author here puts forward the basic hypotheses on Chinese rural residents' consumer behaviors based on Western scholars' research method (Shin and Kim, 2018).

> *Hypothesis 1*: Since consumers obtain independent income, they start to spend their income and wealth in different phases of their life cycle to achieve maximum utility of each phase according to their expected income as rational consumers; but in case of uncertain economic life, consumers will balance consumption and savings to improve their resistance to risks.
>
> *Hypothesis 2*: Faced with both budget constraints and liquidity constraints, consumers' consumption is divided into two parts, productive consumption and living consumption. In general, consumers always value productive consumption over living consumption.

Hypothesis 3: Households adjust their expense to their income. As affected by inherent traditional culture and consumption habits, rural residents never borrow money. It is a traditional virtue of the Chinese nation to have neither internal debts nor external debts. While urban residents have got used to "overdraft consumption," most rural residents are still subject to the "closed budget constraint."

Hypothesis 4: To meet necessary consumption expenditures including marriage, housing, children education, children marriage, medical care and elderly care, most households are economizing on expenditure in their daily consumption, and save some money to cope with consumption peaks. Hence, residents' consumption is periodical, shown as the repeated cycle of savings – consumption – savings – consumption.

Hypothesis 5: In rural areas with the imperfect social security system, residents' consumption is closely related to their phases of life, and associated with specific events, including marriage, housing, children education, medical care, elderly care, etc. They have to make a choice between consumption and savings for the sake of these necessary costs, so consumers' consumption and income show a trade-off correlation in different phases.

Hypothesis 6: Characterized by additivity, consumers' utility function presents the principle of desirability, which means the consumption of more goods (labor) always overtakes the consumption of less goods (labor), but the marginal utility diminishes along with the increase of consumption quantities.

Based on above hypotheses, consumer behaviors of consumers with uncertain expectations will be more cautious. The uncertainty affects consumers' behaviors in two ways. First, it leads to residents' cautious consumption, mainly embodied in the lower consumption expenditure. Second, it shakes residents' confidence and results in the increase of precautionary savings. With fixed income, consumers will make more savings and spend less in the case of greater uncertainties (Morikawa, 2019). On the contrary, the weaker feelings of uncertainties will motivate consumers to spend more and save less. Considering the continuous pandemic, consumers will feel more uncertain, which will further influence their consumption decisions.

Model selection, index design and data source

Model selection

According to Franco Modigliani's life cycle hypothesis, everyone arranges consumption according to the expected income in his/her whole life, saves money when young and uses savings when old, to achieve smooth consumption in his/her whole life. The consumption and saving decision of each household in certain time reflects the household's efforts to achieve the ideal distribution of consumption in their life cycle, while each household's consumption is subject to their c cycle, which can be expressed as:

$$C = a \cdot WR + c \cdot YL$$

In this formula, WR stands for the actual wealth, and a means the marginal propensity to consume wealth, i.e., the proportion of the wealth consumed each year; meanwhile, YL refers to labor income, and c means the marginal propensity to consume labor income, i.e., the proportion of labor income consumed each year.

Individual consumers with uncertain expectations will not arrange their income and consumption based on their life cycle, but become more myopic. The consumption and income of each phase and the savings at the end of the phase are denoted by c_i, y_i, and s_i, where $i = 1, 2, \ldots, 10$; the initial wealth of individual consumers is W_0; the risk-free interest rate (savings rate) is r_f; and the discount rate is denoted by r. Individual consumers will maximize the utility in each phase, i.e.:

$$\max U = U\left(c_1, c_2, \Lambda, c_{10}\right)$$

Meet: $$\sum_{i=1}^{10} \frac{1}{(1+r)^i} c_i + \sum_{i=1}^{10} \frac{1}{\left(1+r_f\right)^i} s_i = \sum_{i=1}^{10} \frac{1}{(1+r)^i} y_i = W_0$$

According to the Lagrange multiplier method, consumers' optimum consumption path is to follow the plan:

$$\max_{c_i, \lambda} L = U\left(c_1, c_2, \Lambda, c_{10}\right)$$

$$+\lambda\left(\sum_{i=1}^{10} \frac{1}{(1+r)^i} c_i + \sum_{i=1}^{10} \frac{1}{\left(1+r_f\right)^i} s_i - \sum_{i=1}^{10} \frac{1}{(1+r)^i} y_i = W_0\right)$$

Upon uncertain conditions, individual consumers have to maximize their utility by accomplishing phased goals in the case of liquidity constraints. In this case, the current consumption will be less than the income, as they will save money for the next phase when consumption will overtake income. Therefore, each two phases constitute a whole, and the life cycle of each individual can be considered as a fluctuated course of consumption with two phases as a feature. Society is a whole made up of individuals, so consumption of society also follows such phased consumption model. In the meantime, each phase shows little relation with other phases (except the adjacent phases), and the savings of the previous phase can be considered as the initial wealth of the current phase (Xuheng and Xin, 2018). Hence, for the convenience of analysis, individual consumers' optimum consumption can be converted into two discrete phases, that is the current phase and the future phase. Hence, the optimum course of consumption should be:

$$\max_{c_1,c_2} U = U_1 + \beta U_2$$

Meet budget constraints: $(c_1 + s_1 = W_0\left(1+r_f\right) + y_1$

$$c_2 + s_2 = s_1\left(1+r_f\right) + y_2$$

Since individual consumption utility is a function of actually obtained consumer goods, the unity function can be expressed as:

$$U_i = U_i\left(c_i, \frac{p_i}{p_{i-1}}\right), \text{ where: } \frac{\partial U_i}{\partial c_i} > 0, \frac{\partial U_i}{\partial\left(p_i / p_{i-1}\right)} < 0, \quad i = 1,2.$$

Eliminate the intermediate parameter s_1 to convert the above two budget constraint conditions into one constraint condition comprising the two phases:

$$c_1 + \frac{1}{(1+r)}c_2 + \frac{1}{(1+r)}s_2 = y_1 + W_0\left(1+r_f\right) + \frac{1}{(1+r)} \quad y_2$$

In the meantime, according to the properties of the utility function, if the utility monotonously increases with consumption, any utility function with the same nature as consumption can express such relationship. Considering the relationship between real consumption data and other factors, the hypothetical utility function should be expressed as:

$$U_i = \left(\frac{p_i}{p_0}\right)^{-1} \log c_i, i = 1,2.$$

Based on the Lagrangian first-order condition for optimum consumption, the general form of the consumption function can be obtained as follows:

$$c_i = c_i\left(\frac{p_0}{p_1}, y_1, \frac{1}{(1+r)}, r_f, W_0, s_2\right), \qquad i = 1,2.$$

It should be noted that the analysis we conduct now only targets individual consumption behaviors from a microscopic perspective. If the utility functions for all residents and the constraint conditions they meet are consistent, the consumption function of all residents could be the simple magnification of individual economic behaviors; in other words, the whole society presents fluctuated consumption (Peter, 2019). Taking this into consideration, the consumption function of Chinese rural consumers, especially rural residents based on China's national conditions can also be expressed as:

$$C = C\left(P, P_0, Y, \frac{1}{(1+r)}, r_f, W_0, S\right)$$

The annual data for empirical test come from China Statistical Yearbook 1978–2006, and the sample period is 1978–2006. We put forward the following econometric model based on the consumption functions above:

$$c_t = \alpha_0 \sum_{i=0}^{p} \alpha_i y_{t-i} + \alpha_p P_{t+1} + \alpha_i i_t \sum_{j=0}^{q} \alpha_j s_{t-i} + \varepsilon_t$$

where P_{t+1} refers to residents' expected inflation rate of the next phase.

Index design

Dependent variable: *per capita* consumption expenditure of rural residents. Consumption is the behavior by which residents spend money to maintain their daily life. When consumers hold certain expectations, a stable relationship is seen between rural residents' *per capita* expenditure and residents' income. This index is obtained by taking the log of the rural residents' *per capita* consumption expenditure deducting rural residents' consumption price index (100 for the previous year) pursuant to China Statistical Yearbook.

Independent variable: We selected rural residents' *per capita* disposable income, expected inflation rate, interest rate and household savings as independent variables. Being an internationally accepted statistical indicator of household income, *per capita* disposable income reflects the influence of income level and income distribution gap on consumption expenditure (Mingyue and Xuheng, 2020). Rural residents' *per capita* disposable income means the income they can freely use, which is calculated by deducting individual income tax and non-tax payments from residents' actual income. The expected inflation rate is an index to measure people's psychological expectations of the inflation rate, which is used to measure residents' expectations of future uncertainty; Interest rate, considering that the main influencing factor of liquidity constraint is interest rate, interest rate is selected as one of the uncertain factors of future liquidity constraint (Xiaojuan and Lijun, 2021). This paper is expressed by the one-year deposit interest rate stipulated by the People's Bank of China. If the interest rate of a certain year is adjusted frequently, the interest rate level of that year is calculated based on the term weighting of each interest rate level. Saving is an important factor affecting the current income of residents' consumption, In the case of a certain income, residents' savings and consumption have the characteristics that one is rising, the other is falling. Therefore, we take the amount of savings deposit as a variable to examine the impact of household savings on consumption.

All data in this paper come from China Statistical Yearbook, with data between 2002 and 2022 as the sample. For Chinese urban residents' *per capita* consumption expenditure and *per capita* disposable income and savings deposit, the actual values are obtained by means of price deflator to exclude the effect of price.

Empirical test results and evaluation

This paper intends to conduct an empirical test on the long and short-term conduction effect between rural residents' consumption and rural residents' disposable income, expected inflation, interest rate and national household savings by means of the cointegration test and the error correction model (Figures 3–7).

Unit root test

With the rural residents' consumption and rural residents' disposable income, expected inflation, interest rate and national household savings in China between 2002 and 2021, this paper conducts an empirical test on the long and short-term conduction effect between rural residents' consumption and rural residents' disposable income, expected inflation, interest rate and national household savings by means of the cointegration test, the ECM model and Granger causality test. The logarithms of the five values above are used as the variables of the model, respectively denoted as $Ln(c), Ln(y)$, p_{t+1}, r and $Ln(s)$, where the added value of each sector represents the composition of economic growth.

Unit root test on $Ln(c)$

Conduct ADF test on the $Ln(c)$ series, determine the optimum lag order ($p = 1$) based on the SC rule, and obtain the test results (including the trend and constant) as shown in Table 1.

Seen from Row 1 of Table 1, at the significance level of 1%, $t = -1.322222 > -3.6736$, demonstrating that the original hypothesis is accepted and $Ln(c)$ is non-stationary. The results of the ADF test on ”$Ln(c)$ is displayed in Row 2, suggesting that the original hypothesis is rejected at the 5% significance level of ”$Ln(c)$ and ”$Ln(c)$ is considered as stationary series. In other words, $Ln(c)$ is an integrated series of order one, denoted as $Ln(c) \sim I(1)$.

Unit root test on $Ln(y)$

Conduct ADF test, determine the optimum lag order based on the SC rule, and obtain the test results (including the trend and constant) as shown in Table 2.

According to the results of ADF test, $Ln(y)$ accepts the original hypothesis as it is non-stationary; and $\Delta Ln(y)$ rejects the original hypothesis as it is stationary. The same conclusion can be obtained through other test methods that $Ln(y)$ is an integrated series of order one, denoted as $Ln(y) \sim I(1)$.

Unit root test on expected inflation rate p_{t+1}

Conduct ADF test, determine the optimum lag order based on the SC rule, and obtain the test results (including the constant at the zero-order differential, and including the trend and constant at the first-order differential) as shown in Table 3.

As shown in Table 3, the *p* value of the expected inflation rate p_{t+1} in the ADF test is 0.5960, demonstrating that the unit root is found at 59.60% and p_{t+1} is non-stationary; and Δp_{t+1} is non-stationary and rejects the original hypothesis. The same conclusion can be obtained through other test methods that p_{t+1} is an integrated series of order one, denoted as $p_{t+1} \sim I(1)$.

Unit root test on interest rate r

Conduct ADF test, determine the optimum lag order based on the SC rule, and obtain the test results (including the trend constant at the zero-order differential, and excluding the trend and constant at the first-order differential) as shown in Table 4.

According to the ADF test results in Table 4, the interest rate r accepts the original hypothesis and is non-stationary; and $\varnothing r$ is non-stationary and rejects the original hypothesis. The same conclusion can be drawn through other test methods that r is an integrated series of order one, denoted as $r \sim I(1)$.

Unit root test on $Ln(s)$

Conduct ADF test, determine the optimum lag order based on the SC rule, and obtain the test results (including the trend constant at the zero-order differential, and excluding the trend and constant at the first-order differential) as shown in Table 5.

According to the ADF test results in Table 5, the $Ln(s)$ accepts the original hypothesis and is non-stationary; and $\Delta Ln(s)$ is non-stationary and rejects the original hypothesis. The same conclusion can be drawn through other test methods that $Ln(s)$ is an integrated series of order one, denoted as $Ln(s) \sim I(1)$.

To sum up, $Ln(c), Ln(y)$, p_{t+1}, r and $Ln(s)$ are all integrated series of order one, on which we can conduct the cointegration test.

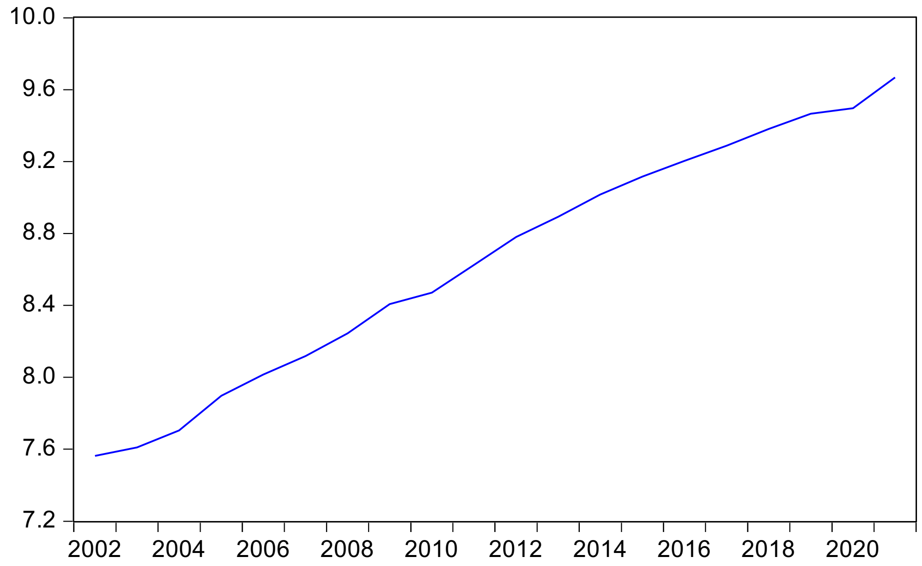

FIGURE 3
Trend of rural residents' actual consumption.

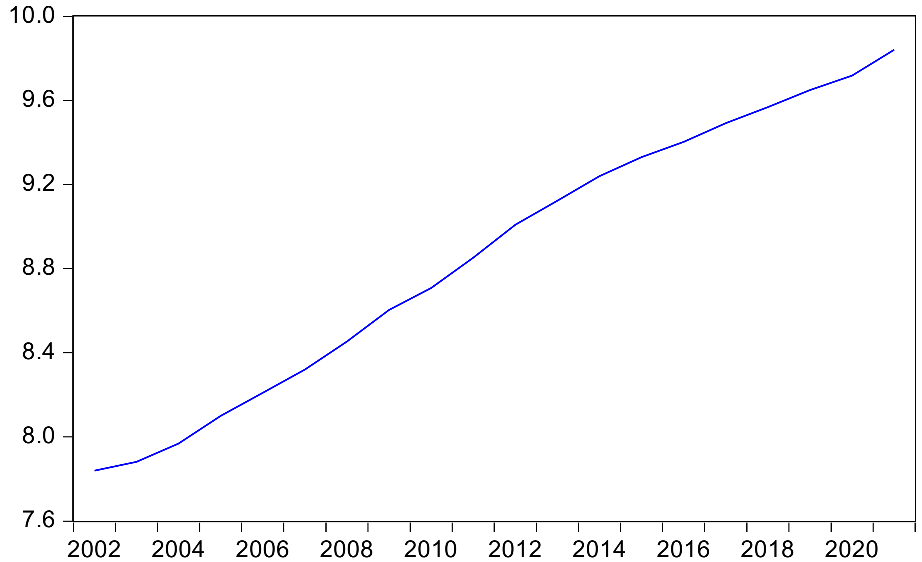

FIGURE 4
Trend of rural residents' actual income.

Cointegration test

(1) As $Ln(c), Ln(y)$, p_{t+1}, r and $Ln(s)$ are all integrated series of order one, we can conduct the cointegration test based on Engle-Granger two-step method on these five variables, and establish the model below:

$$c_t = \alpha_0 + \alpha_y y_t + \alpha_p p_{t+1} + \alpha_i r_t + \alpha_s s_t + \varepsilon_t$$

Then we adopt OLS estimation, conduct the unit root test on the residual term $\hat{e}_t$, and determine the lag order based on the SC rule. The results are shown in Table 6.

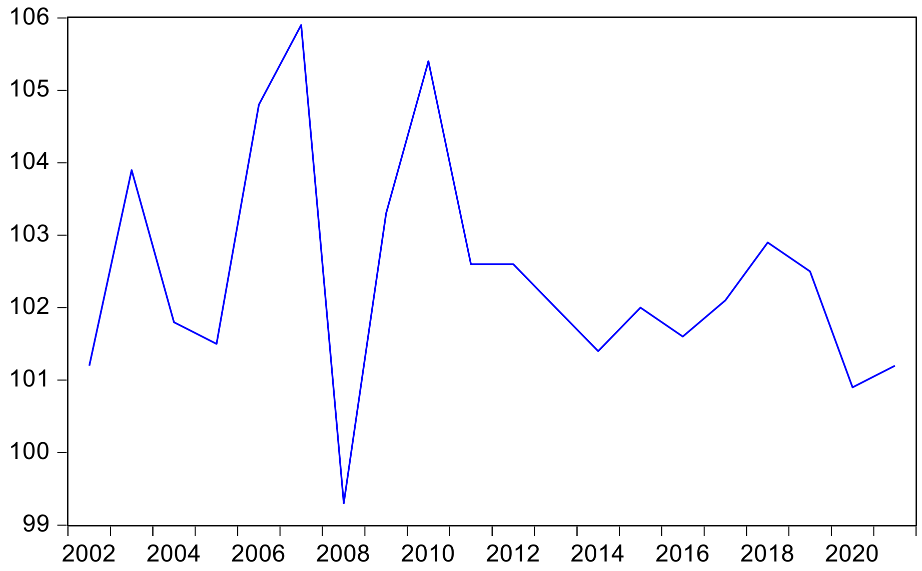

FIGURE 5
Trend of expected inflation rate.

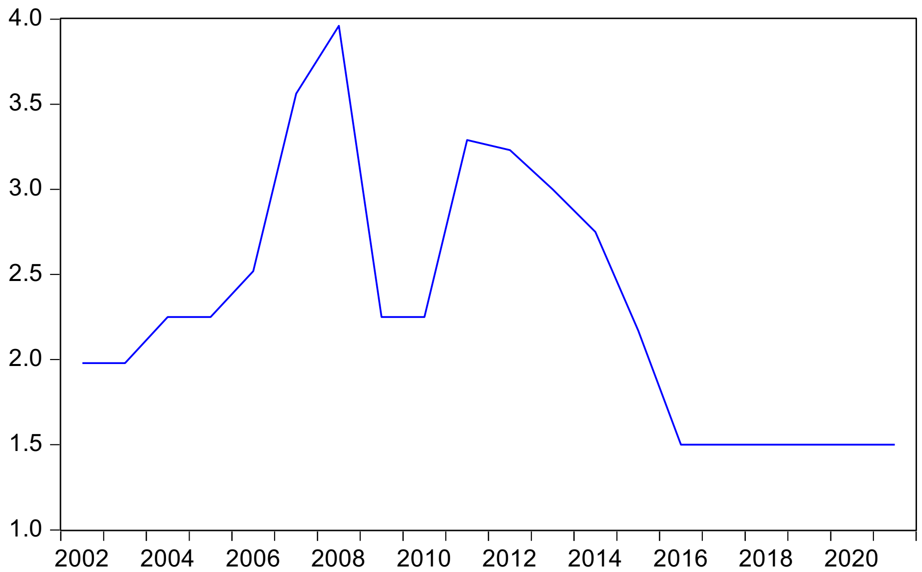

FIGURE 6
Trend of interest rate.

The results show that ADF test statistics is-3.872457, P is 0.0416, and the critical value of EG two-step method is greater than t statistics, so it rejects H0 and suggests that the residual serial is stationary without unit root, and cointegration relationship is seen among these variables. Therefore, regression estimation can be performed.

$$Ln(c_t) = -0.98 + 0.92Ln(y) + 0.003\hat{p}_{t+1} - 0.002r$$
$$-0.095793Ln(s) + e_t, t = 1, 2, \cdots T$$

According to the estimates of the model, rural residents' consumption shows positive correlation with current income and

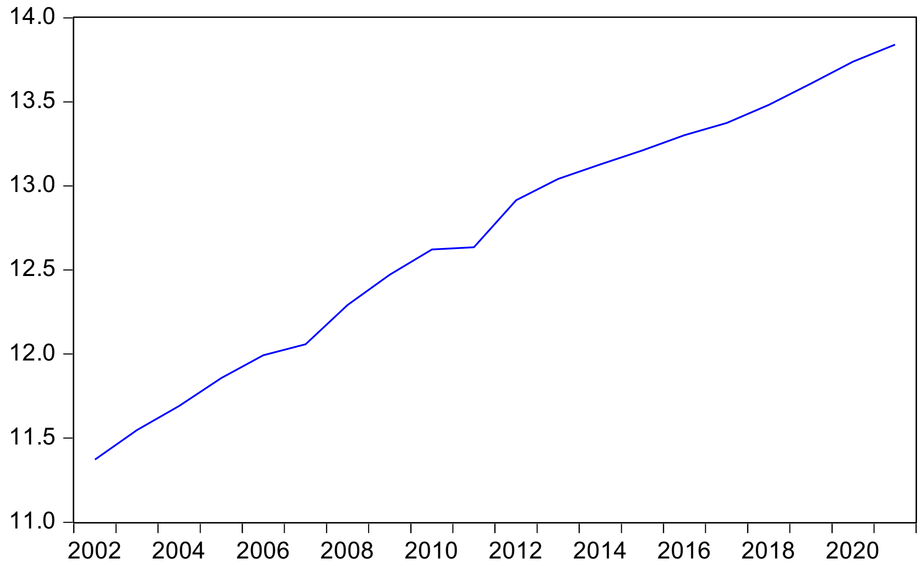

FIGURE 7
Trend of national residents' savings.

TABLE 1 Ln(c) ADF Test Results.

Difference order	t-statistic	Critical value (5%)	Prob.*
0	−1.322222	−3.6736	0.8501
1	−4.369455	−3.0404	0.0035**

***Means being significant at the 1% level.
**Means being significant at the 5% level.
*Means being significant at the 10% level.

expected inflation rate and negative correlation with the interest rate and savings. The results display a long-term balance among these variables.

Establishment of the error correction model

These variables are balanced in the long run, but may be out of balance in the short term, so the ECM model is adopted to analyze the dynamic relations among these variables. Establish the ECM model based on $ecm_t = \hat{e}_t$ with the residual serial $\hat{e}_t$ as the error correction term, and obtain the short-term dynamic disequilibrium equation by means of regression:

$$\Delta Ln\left(c_t\right) = -0.155825 + 0.837421\Delta \mathrm{Ln}\left(y_t\right) - 0.000987\Delta p_{t+1} - 0.009057\Delta r_t - 0.050693\Delta \mathrm{lns} + 0.938302\,\hat{e}_{t-1}$$

$$t = \left(-5.473186\right)\left(9.257759\right)\left(-0.589445\right)\left(-1.313997\right)\left(-0.806073\right)\left(5.817869\right)$$

$$R^2 = 0.912\ F = 26.99$$

In the error correction model above, the difference reflects the impact of short-term fluctuation. The short-term changes in rural residents' *per capita* consumption in China are divided into two parts, respectively the impact of short-term fluctuation of rural residents' *per capita* disposable income, and the impact of deviation from long-term equilibrium. The error correction term reflects the adjustment effort against the deviation from long-term equilibrium. As indicated by the factor estimate (0.938302), when the short-term fluctuation deviates from long-term equilibrium, the adjustment effort of (0.938302) will be applied to return to the state of equilibrium.

Conclusion and policy suggestions

Research conclusion

The following conclusions can be drawn upon the analysis of the consumption decisions of Chinese rural residents with uncertain expectations:

Uncertainty is an inevitable and objective reality. Normally, certain economic variables may produce uncertainties, while the uncertain external environment will aggravate residents' uncertain feelings and thus affect residents' consumption decisions (Huang and Luk, 2020). Also as a result of uncertainties, Chinese rural residents have irrational expectations, which will not only lead to residents' cautious consumption but also undermine residents'

TABLE 2 *Ln(y)* ADF Test Results.

Difference Order	t-statistic	Critical Value (5%)	Prob.*
0	−0.736989	−3.0299	0.9933
1	−3.477634	−3.2869	0.007*

***Means being significant at the 1% level.
**Means being significant at the 5% level.
*Means being significant at the 10% level.

TABLE 3 p_{t+1} ADF Test Results.

Difference order	t-statistic	Critical value (5%)	Prob.*
0	−0.209267	−1.9628	0.5960
1	−7.666062	−3.0522	0.0000**

***Means being significant at the 1% level.
**Means being significant at the 5% level.
*Means being significant at the 10% level.

TABLE 4 *r* ADF Test Results.

Difference order	t-statistic	Critical value (5%)	Prob.*
0	−1.562555	−3.0207	0.4814
1	−4.956881	−1.9614	0.0001***

***Means being significant at the 1% level.
**Means being significant at the 5% level.
*Means being significant at the 10% level.

TABLE 5 *Ln(s)* ADF Test Results.

Difference order	t-statistic	Critical value (5%)	Prob.*
0	−1.732646	−3.6736	0.6962
1	−4.868837	−3.0404	0.0013***

***Means being significant at the 1% level.
**Means being significant at the 5% level.
*Means being significant at the 10% level.

confidence. Therefore, instead of arranging consumption based on the whole expected income to smoothen their lifetime consumption, residents make phased plans of consumption since they have independent income, to cope with consumption peaks in different phases. In this case, the irrational expectations resulting from uncertain feelings will lead to rural residents' short-sighted consumption behaviors. Consumers will "rationally" choose between consumption and savings with their income to accomplish their phased consumption goals and tend to make savings against major events.

Consumers' income, consumption, consumption habits, liquidity constraints and precautionary savings jointly produce the feelings of uncertainty, which will lead to irrational expectations that induce rural residents' short-sighted consumption. Consumers will "rationally" choose between consumption and savings with their income to accomplish their phased consumption goals and tend to make savings against major events. Therefore,

TABLE 6 Residuals of the unit root test Results.

Variable	Inspection type	ADF	Prob.*
$\hat{e}_t$	None	−4.402389***	0.0416**
	Intercept	−3.872457**	0.0042***
	Trend and intercept	−4.402389***	0.0003***

$\hat{e}_t$ means residual serial.
***Means being significant at the 1% level.
**Means being significant at the 5% level.
*Means being significant at the 10% level.

corresponding policies measures shall be carried out to eliminate the uncertain feelings of rural residents, and ultimately achieve the goal of promoting rural residents' consumption and economic growth.

Policy suggestions

The government's macroeconomic policies are of great significance to rural consumption. Considering the law of the changes in rural consumption, we shall carefully analyze the factors influencing rural residents' consumption, put forward corresponding policies and measures, and thus enable the beneficent cycle of "promoting rural consumption – driving the supply-side growth – enhancing high-quality economic development." The following measures shall be included:

Increase rural residents' income and achieve consumption and rural revitalization

As a special consumer group, rural residents are consumers and direct producers, operators and investors at the same time (Jessika et al., 2022). Various measures shall be applied to increase peasants' operating income, wage income, net income from property and net income from transfer, thus to guarantee the stable growth of peasants' income, including:

First, increase the operating income of residents. The prosperous development of agriculture constitutes the foundation for promoting peasants' income. The net operating income currently occupies 1/3 of the total income of rural residents. We should support the integration of digital economy into rural technologies, reform and upgrade the industrial chain of agriculture, develop high-quality and efficient agriculture, and improve the supply quality of agricultural products and comprehensive agricultural benefits. Second, the employment channels for peasants shall be expanded to increase rural residents' wage income. For this end, the government shall increase local jobs of rural residents and the job opportunities for migrant workers, strengthen the skill training and vocational education of residents, improve the financial, tax and industrial support policies for employment, and offer stable work opportunities to migrant workers. Third, the land system reform in rural areas shall be strengthened to increase peasants' income from properties. Finally, as an important part of the improvement of the redistribution regulation system, peasants' transfer income shall be increased (Ross, 2022).

Reform the income distribution system to achieve common prosperity

Since the Reform and Opening Up, the income gap has gradually emerged and been widened. To improve the income distribution system by means of the third distribution, we shall promote common prosperity from two dimensions, the "common prosperity of spiritual life" and "common prosperity of material life" for both urban and rural areas. To achieve this goal, the follows shall be done: ①Cultivate the subjects of social charity. Inspire social capital registered charity institutions to play a more active part in charity activities in a voluntary manner, and especially encourage and lead high-income groups to participate in charities; ② Improve the third distribution mechanism in the rural areas. Establish the emerging third-distribution platforms such as online charity activities and Internet donation platforms; ③ Consummate the donation methods by transforming the money and material donation to equity, skill and technology donation; ④ and improve the system of encouragement for third distribution, and promote the third distribution through fiscal policies, tax policies and industrial policies. We shall give full play to the market mechanism, social mechanism, administrative mechanism, cultural mechanism, digital governance mechanism and common prosperity evaluation mechanism.

Improve the rural financial system and financially enable rural consumption

Finance makes the foundation of the national economy, while the development of rural finance constitutes the major motive force for the development of rural economy and rural consumption (Yoon et al., 2021). Rural residents' consumption has been restrained due to the liquidity constraints. ①Strengthen the construction of rural finance infrastructure. Establish new service points in addition to the existing rural finance network, and extend the coverage of ATMs to remote areas. ② Innovate the systems and mechanism of rural financial services. The consumption system plays as an important guarantee for finance-driven rural consumption. ③ Guide financial institutions to allocate financial resources rationally in rural areas, innovate consumption credit products there and enrich the models of credit mortgage and pledge. ④ Support rural finance with digital economy, apply artificial intelligence, big data and other advanced digital technologies to help with the credit rating of agricultural enterprises and rural residents, establish and improve the query system and credit rating system of rural consumption loans, and thus lower the credit risks of commercial banks. ⑤ Enhance the service capability of agricultural insurance, and promote the innovation of agricultural insurance products. Agriculture is naturally vulnerable to both natural risks and market risks, so agricultural insurance shall be developed to diversify risks.

Reinforce the construction of rural consumption infrastructure

Coordinate urban and rural development, narrow the urban–rural consumption gap, and especially narrow the urban–rural gap in terms of public services and consumption. Since the rural areas in different regions in China vary greatly in natural resources, population and development potential, the key to narrow the urban–rural gap is to balance the public services and consumption infrastructure of rural residents in different regions. Hence, the following measures shall be adopted: ① Motive rural consumption through technology, and encourage new consumption patterns to march into rural areas. ② Establish the logistics system in rural areas and strengthen the construction of modern distribution network there, to effectively lower the distribution cost in rural areas. ③ Strengthen the water and power supply system and road construction in rural areas. ④ Promote the development of digital rural construction. Establish the big data service system for rural areas and agriculture, incorporate the new-generation information technology in agricultural production and operation, and realize smart agriculture. ⑤ Promote the telecommunication service compensation system, and especially support the information and communication infrastructure construction in remote areas. ⑥ Reinforce digital construction in rural social governance, public services, etc. The government and social capital shall cooperate in investment, to inspire social forces to take a part in rural infrastructure construction.

In conclusion, multiple policies shall be applied at the same time to stimulate rural consumption (Anderson et al., 2022). These policies shall be coordinated with each other in terms of the goals and the implementation date, and shall never contradict with each other, thus to maintain the systematic characteristic of rural consumption. Only by taking all things into consideration can the concerted force of policies be formed, and can the effect of various policies be maximized, finally to eliminate uncertain expectations of rural residents, promote rural consumption and drive the national economic development.

Data availability statement

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author.

Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication. LH, XL, and SM were involved in building the framework and searching for information during the conception of the article. LH did the main work of writing the paper. The authors of this paper contributed the equal.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Developing local crisis leadership – A research and training agenda

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The crisis triggered by Covid-19 has exposed the interdependencies of modern society and sparked interest in local response to protracted and complex crisis situations. There has been a growing awareness and interest in the key roles of political and professional stakeholders, their emotional regulation and how they influence team performance and outcomes in dealing with uncertainty and complex crisis situations. While cognitive and behavioral aspects of crisis leadership are well researched, less is understood about how one can mitigate negative emotions, instill trust, or restore public faith and support of security forces and emergency response teams during crises. In addressing this gap, we propose a simplified conceptual roadmap for research and training of local crisis leadership. In this, we emphasize *complex problem solving*, *team interaction, team context and technology* and *team training design*. These four factors represent significant barriers if neglected. On the other side, they may be considerable force multipliers when better understood and managed. We suggest how seven research and training questions could be linked to the four conceptual factors and guide an evidence-based approach to develop local crisis leadership.

KEYWORDS

crisis leadership, complex problem solving, simulation, team training, technology, performance, resilience, emergency

1. Introduction

Crises can generally be understood as rare events that are unexpected, highly salient, and potentially disruptive for individuals, organizations, and societies (Bundy et al., 2017). Still, crisis events can also become crucial turning points for positive change and provide new learning opportunities when they are well managed (James et al., 2011). Success or failure in crisis situations rests on the training and preparedness of frontline personnel and local crisis response units. The protracted response to the Covid-19 pandemic emphasized the significance of political leaders as part of the crisis response in local communities. Local political or senior administrative leaders can serve an important role, by instilling trust and assure the public about societal preparedness and safety. The pandemic showed that political leadership matters: from international cooperation, or the lack thereof, to the influence on individual behavior, the nature of politics shapes responses and outcomes (O'Flynn, 2021). Even if local resources are limited and need to be complemented by regional or national resources, the local communities often have to shoulder the main efforts in the initial crisis response. Still, there is limited research on training and development of local crisis response capacities, procedures, and interoperability. Thus, the overall aim of the present study is to contribute to close this gap by suggesting an evidence-based framework for research and training of crisis leadership and resilience management in local municipalities.

The uncertainties, disruptive, and cascading effects of Covid-19 prompted a need to shift from risk management to resilience management (Pescaroli and Needham-Bennett, 2021). One of the core issues of resilience management is the local capacity to deliver safety critical services to the public, despite uncertainty and disruption. In general, resilience management will refer to the political and operational capability to respond, adapt, recover, and learn from, disruptive and threatening events. Not surprisingly, the pandemic has spurred a renewed interest in the emotional aspects of crisis leadership (Wittmer and Hopkins, 2021). The emotional regulation of the leader – follower exchange works both ways and influence trust, resilience, and team performance in complex crisis situations (Gooty et al., 2010). Leaders' capability to respond and adapt to a high-risk situation, including their self-awareness and emotional awareness may influence task coordination, communication, and performance at the team level (Dasborough and Scandura, 2021). In a review of crisis leadership studies Bavik et al. (2021) concludes that while studies of cognitive and behavioral aspects of crisis leadership is common, less is understood about how leaders can mitigate negative emotions and restore the positive emotions of stakeholders and constituencies during crises.

Covid-19 reinforced the crucial role of local crisis leadership by highlighting the interdependence and need to coordinate organizational assets to ensure an effective response (Cheng, 1983) from municipality leaders. The pandemic highlighted the need for close collaboration between public health officials and political leaders to work in concert over time to address the immediate, long-term, and recurring consequences from the pandemic. In many communities' business executives were forced to consider layoffs (Oen et al., 2022). In the public sector school closures and distance learning raised new challenges for school principals (Lien et al., 2022). Subsequently, there is a growing awareness about the need to consider policy implications of protracted crisis interventions, educate, train, and prepare local municipality leaders for their roles in a crisis response. In addressing this gap, we propose a multidisciplinary framework and offer eight research questions to enhance our understanding of how individual, interpersonal, and contextual factors contributes to local crisis leadership. We believe training of local crisis response units needs to be informed by an interdisciplinary approach based on operational psychology (Johnsen et al., 2010), organizational dynamics (Weick and Quinn, 1999; Salas et al., 2005), and political science (Christensen et al., 2019) addressing both the human, operational, structural and policy aspects of crisis leadership. In addition, the Covid-19 pandemic has highlighted the special challenges of protracted situations where contextual factors influence crisis leadership, trust, and resilience over time (Pescaroli et al., 2021).

To this end, we allude to four core assumptions. First, in line with Dörner and Funke (2017), we believe there is a need to build better and more systematic knowledge about emotional aspects of complex problem solving since decision making represents a core aspect of crisis leadership and team processes. Crisis leadership in protracted and cascading events taxes heavily on limited cognitive and emotional resources. Madera and Smith (2009) examined how the expression of anger and sadness influences the evaluation of leaders in crisis situations. Their study revealed that a leader expressing sadness was evaluated more favorably than a leader expressing anger. Managing emotions is therefore a vital element of crisis leadership and complex problem solving skills before, during, and after emergency situations (Jordan and Troth, 2004).

Second, we follow up Flin et al. (2017) emphasis on the need to address the interpersonal dynamics in operational assessment, training, and preparedness. It is hardly surprising that crisis leadership in emergency services is highly dependent on teamwork (Salas et al., 2007a). Teams are identifiable social work units consisting of two or more people with several unique characteristics including: (1) dynamic social interaction with meaningful interdependencies; (2) shared and valued goals; (3) a discrete lifespan; (4) distributed expertise; (5) clearly assigned roles and responsibilities (Salas et al., 2007b). Thus, local crisis leadership units need to consider how to develop and regulate both positive emotions (i.e., trust, collective efficacy, confidence) and negative emotions (i.e., frustration, anger, fear) that are necessary for creating resilient high-performance teams (Salas et al., 2007a). Even if cognitive, emotional, and interpersonal skills are seen as crucial, these "non-technical skills" have often been ignored or taken for granted, since leaders in crisis response units are mostly recruited based on their professional seniority and technical skills.

In local crisis situations decision making and coordination of activity will flow through the normal chain of command using emergency dispatch centers or directly through an operational staff (Dörner and Funke, 2017). The latter depends on the complexity, sustainability, and consequences of the situation where it is anticipated that the resources of the dispatch centers will be exceeded. However, both coordinating entities rely heavily on a seamless coordination of individual capabilities, team resources, and available structural assets to mobilize a sustained crisis response. Still, coordination through "the chain of command" and by operational staff, presents different levels of complexity. A better understanding of how the command-and-control processes operate in local crisis leadership could therefore be important to improve performance and design more effective unit-level training programs (Zemba et al., 2019).

Third, we emphasize the need to consider how contextual factors such as cascading or protracted events and technological failure may influence crisis leadership, risk, and disaster preparedness (Pescaroli et al., 2021). Effective crisis leadership depends on close inter-agency coordination and collaboration at the local, regional, and national level to maintain a resilient response. A particular situation will define the needs of a response operation, the roles and procedures that can be applied and the conditions for teamwork, constituting team context. To fully understand and develop effective crisis leadership in the municipalities, we believe there is a need to also understand the nature of external contingencies. Contextual factors, such as organizational environment, technological equipment and use of coordination and control tools, and available information on the situation, will constitute challenges for the response, but also represent opportunities to develop relevant training and skill assessment for local crisis response units.

Fourth, state-of-the-art simulator environments have been adopted to improve training and allow scenario based, true to life training in crisis leadership (Roberts et al., 2021). Simulations may offer an excellent opportunity to train non-technical skills in a controlled, safe, and realistic environment (Saus et al., 2010). Different types of simulation exercises may be a useful tool to train stakeholders who deal with crises and develop their skills on making decisions under stress, dealing with own emotions, situation, and their team. A resilient response rests on the capacity of front-line operators and stakeholders to uphold their mission, despite setbacks and critical stressors (i.e., technological breakdown of strategic infrastructure). The total spectrum of human factors, from individual complex problem solving *via* dynamics in team and team-training and the availability of normative structural guidance, is crucial to crisis leadership. However, focus of training is often on testing and following procedural guidelines. More information is still needed on how emotional factors and team dynamics could enhance training and development of local crisis response units (Bavik et al., 2021).

As depicted in Figure 1, we propose a generic and multidisciplinary approach to understand local crisis leadership as a function of psychological, interpersonal, and contextual factors. These factors may represent significant barriers or considerable force multipliers, depending on how they are understood and managed. While each factor is evidence based and can inspire future research, we believe this generic and relatively simple model will be easy to understand and apply to team training design and development of local crisis leadership capacities across different crisis response units. In the following, the model will be outlined in more detail.

2. Complex problem solving

Complex problem solving is an integrated aspect of crisis leadership. Complex problem solving can be regarded as a collection of self-regulated psychological processes and activities necessary in dynamic environments to achieve diffuse or ill-defined goals that cannot be reached by routine actions (Dörner and Funke, 2017). For example, the problem solving processes of a local crisis response leader influenced by cognitive (e.g., judgment, decision-making, planning abilities), emotional (e.g., regulation of emotions elicited by a situation), and motivational aspects (e.g., material, or ecological rationality) (Sayegh et al., 2004). These cognitive and emotional phenomena are of particular importance in high stakes situations where risks are interconnected, interacting, or cascading (Pescaroli and Alexander, 2018). A study by Zemba et al. (2019) suggested that research on complex problem solving must focus more on the original complexities of real-life problems to improve our understanding of how humans deal with pressing problems. Although machine learning is developing rapidly, human involvement in decision processes will still play a significant role in the foreseeable future (Roberts et al., 2021). Since humans cognitively appraise and react emotionally to environmental cues in situations (Gross, 2002), it is therefore of particular importance to train and develop local crisis leadership skills.

In general, acute stress and crisis usually elicit negative emotional states such as fear and worry. Understandably, a lack of systematic training and preparedness of political or administrative leaders, poses a risk of introducing an extra element of uncertainty to complex problem solving in local crisis leadership. Based on the classical understanding of decision-making and rationality, emotions are seen as irrational and negatively related to higher order cognitions such as judgement and decision-making (Kahneman, 2011). However, the relationship between emotions and rationality is complex, since emotions also may have a positive impact on decisions (Pham, 2007). For example, Hansen et al. (2009) reported that fear induction augmented the cognitive performance in military personnel. An important issue in crisis leadership is therefore how local crisis response leaders appraise their emotional reactions to stressful and rare events. In short, how they regulate and make use of their affective responses in safety critical situations (Gyurak et al., 2012). In local crisis response negative emotions such as frustration, anger, or fear may have a significant disruptive effect on the quality of crisis leadership (Jordan and Lindebaum, 2015). From this we propose the following research and training objective:

> 1: How will negative emotion induction influence the outcome of complex problem solving in local community responses to crisis situations?

Although there is consensus that affective states will influence complex problem solving, research indicates differential outcomes depending on the emotion regulation strategies used (Ford and Mauss, 2015). Research has shown that there are cultural differences in emotion regulation strategies for instance, individuals from Asian backgrounds are more likely to use suppression compared to individuals with a European background (Ford and Mauss, 2015). Recent research has therefore started to investigate the effects emotions and emotion regulation may have on different practical domains in life (e.g., Ford and Gross, 2018; Karnaze and Levine, 2018). Still, research investigating crisis leadership's choice of emotional regulation strategies is scarce, and even more so, how local political leaders attend to the emotional aspects of protracted crisis situations. Great variation exists in selection, education, and training of crisis response personnel, from no selection and very little training of political/strategic decision makers to extremely strenuous procedures for selection and training of specialized crisis response units. This in turn may contribute to cultural differences between local crisis response units and crisis managers. A pressing issue is therefore if potential variations in emotional regulation strategies may have adaptive consequences in strategic, tactical, and operational approaches to an unfolding crisis? From this, we believe it will be of importance to investigate the effects of negative emotion induction and to identify the choice of emotion regulation strategies across different crisis response entities.

Moreover, to prepare local decision-makers for future crises, evidence-based training and development need to be designed and implemented to improve crisis leadership (Lacerenza et al., 2018). Complex problem solving usually involve knowledge-rich requirements and collaboration among subject matter experts with different expertise and backgrounds, including novices. Thus, more knowledge about complex problem solving on the individual level will have important implications for team interaction and performance, team context and technology, as well as team training design. To this end we propose the following research and training objective:

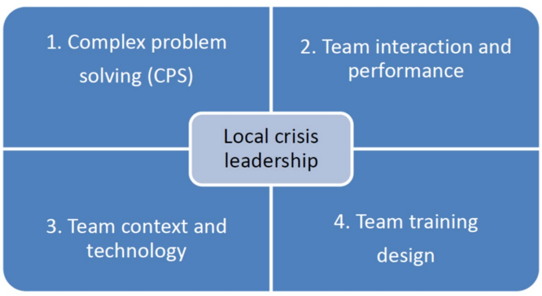

FIGURE 1
Core aspects of local crisis leadership.

> 2: How can emotion regulation strategies be useful in complex problem-solving situations that taxes different levels of cognition?

3. Team interaction and performance

A local crisis response unit can be a group of two or more individuals who have specific roles and interact adaptively, interdependently, and dynamically toward a common and valued goal (Roberts et al., 2021). Thus, an understanding of how situation awareness in individuals, teams and systems are impacted and evolve are important in developing local crisis response capacities, teamwork, and training. For an overview of research on situational awareness (see Salmon et al., 2008; Stanton et al., 2017). Teamwork is essential for effective crisis response in emergency services and law enforcement. Teamwork can be defined as the knowledge, skills, and attitudes critical for team members to interdependently interact with one another effectively in such a way that leads to positive team-based outcomes (Salas et al., 2009). Thus, the local crisis response is dependent on skilled individuals who can perform effectively as a collective. In many instances operational situations will require new, creative, or highly skilled coordination of actions in time critical situations (Lacerenza et al., 2018). Studies of Naval operations have shown that just one new team member may have significant disruptive effects on team interaction and effectiveness (Espevik et al., 2011). To maintain a resilient response over time, local crisis response units need to train, coordinate, and develop their taskwork and teamwork resources from various professionals.

The Shared Mental Model (SMM) approach (Salas et al., 2005) emphasizes the importance of shared knowledge structures within a team to facilitate coordination and performance. The model consists of three coordinating mechanisms (trust, shared mental model, and closed loop communication) to ensure even distribution of information within the team. These coordinating mechanisms further guide the five team-processes of leadership, monitoring, support, adaptation, and team orientation (Salas et al., 2005). Thus, the performance of a local crisis response unit will depend on the flow of information from the coordinating mechanisms and the outcomes of the team processes. A core aspect of SMM is the ability to predict other team members actions. There is a link between the SMM and complex problem solving in that the mental model includes a shared history of affective experiences from significant gains and losses in previous team interaction. This joint history of previous actions contributes to the SMM and facilitates the prediction of other team-members' affect and future behavior (Thornton and Tamir, 2017). A better understanding of team dynamics involved in local crises response will then serve to develop future crisis leadership capacities and more effective team training. Thus, our third research and training objective is as follows:

> 3: How can coordinating mechanisms and team processes enhance situational awareness and quality of local decision making in an interdisciplinary crisis response staff?

Frontline policing is an example of first echelon crisis leadership where the incident commander relies heavily on communication with the police dispatch center, which acts as an information hub and coordinating entity, cooperating closely with the emergency medicine and critical care, fire and rescue operational centers. The goal is to save lives and preserve health in time critical situations. In most cases the incident commander will coordinate through the line of command, but if the crisis is perceived as too massive or requires a protracted response, an operational staff is established (i.e., coordination through staff). Both coordination through the line and staff involves team-behavior, since a team is defined as two or more subjects coordinating their activities toward a common goal (Parelta et al., 2018). One promising strategy to increase team performance in operational situations has been to develop greater NTS awareness in policing (Schaveling et al., 2017). In operational situations there is therefore a need to identify, explain, and mitigate dysfunctional and functional NTS both in the form of normal coordination "through the line" and in the more complex coordination through a crisis response staff when managing protracted societal emergencies (Rico et al., 2008).

Shared mental models is in general considered to facilitate team coordination and support to accommodate team performance over time and in response to changing demands in the environment (Mathieu et al., 2000). Still, anecdotal evidence and preliminary studies (Terpstra, 2018) of crisis leadership have indicated a lack of situational awareness, flexibility and procumbent quality of decisions when coordinating through staff compared to coordinating through the line. Since the organizational set-up is similar for police, health, and the fire & rescue services a generic model could be developed with relevance for all emergency services. However, the coordination between professional crisis responders and the local political or administrative leaders presents additional challenges. Thus, an in-depth understanding of the cognitive, emotional, and behavioral workings of front-line response teams would be crucial to command and coordinate local resources. From this, we suggest the following research and training objective:

> 4: How will mechanisms and processes of coordination influence local crisis response when coordinating is facilitated by staff versus by line?

While studies on teamwork traditionally have focused on face-to-face contact, recent studies have also examined virtual teams (i.e., geographically dispersed operators). A challenge for operational virtual teams is that the teamwork processes become technology dependent. Although less studied in virtual teams, a promising theoretical approach to develop teamwork processes is the "shared mental models" (SMM) approach to sensemaking in teams (Rafaeli et al., 2009). Overlapping mental models within a virtual team enables individual team members to anticipate or predict the activities and needs of other team members (Cannon-Bowers et al., 1993). Research from our group suggests that SMM contributes to enhance performance in police units (Espevik et al., 2021). However, a common factor in these studies was the significance of face-to-face contact within teams. In virtual teams, sub-optimal team performance is often caused by process loss due to a failure to synchronize the mental models of individual members (Rico et al., 2008).

In a review Peavey and Cai (2020) concluded that decentralized intensive care units were less likely to call for support due to a lack of visibility and proximity between caregivers. A recent study investigated medical dispatch teams (operators and ambulances) using the theoretical framework of SMM (Johnsen et al., 2022). Although an acceptable fit was found for the theoretical model, the different elements varied in their predictive power. This indicates a need to provide a better and more comprehensive understanding of distributed team processes. Floren et al. (2018) argue that the SMM construct itself lacks clear operational definition and conclude in their review that surprisingly few studies describe educational interventions aimed at SMM development or attempt to measure the construct. To close these gaps, we propose the need for empirical studies that could describe and explain coordinating mechanisms and team processes in front-line operators and how team processes in distributed teams will contribute to improve situational awareness and decision making in a local crisis response staff. Typically, a local operational staff will include seasoned subject matter experts (personnel, intelligence, operations, logistics, planning etc.). Notably, these local organizational units are rarely mustered and/or trained. Rotation of personnel, infrequent training, and limited use of operational staff in operational situations represents a significant barrier to establishing shared cognitive structures and sufficient training to facilitate effective team performance. To our knowledge there is limited knowledge about the use and effectiveness of such shared knowledge structures in a local operational staff compared to teams comprised of dispatch operators and patrols. Still, the use of virtual teams has increased in many domains during Covid-19 and could present a preview of future ways to organize and train operational staff functions. The increased potential for information exchange through technological aids could facilitate, impair, or have a neutral effect on effectiveness (Johnsen et al., 2019). Most studies on the development of SMM and its relation to team effectiveness are anchored in an understanding that the relation is motivated by increased interaction between team members, increased communication, and training. In general, a reasonable assumption would be that more use of information communication technology could augment the effect of human interaction processes (i.e., teamwork) on team effectiveness. In this domain few if any studies have investigated the effect of both coordinating mechanism and team-processes on crisis management staff in virtual teams. To close this gap, there is a need to examine differences in coordinating mechanisms, team processes and effectiveness between virtual and face-to-face staff work based on the SMM framework. Thus, our fifth research and training objective is as follows:

> 5: Can the SMM framework explain possible differences in coordinating mechanisms, team processes and effectiveness between virtual and face-to-face coordination of local crisis response?

4. Team context and technology

Crisis leadership and team performance are influenced by contextual factors (Andreassen et al., 2020). Following from Oc (2018), context can be seen at two different levels: 1) the omnibus context and 2) the discrete context. In a crisis such as the COVID-19, the omnibus context involves a broad consideration of contextual or environmental influences such as health care resources, economy, political stability, and socioeconomic factors. In contrast, the discrete context relates to specific situational variables that influence behavior directly or moderate relationships between variables in a specific context. Thus, according to Oc (2018) crisis leadership and team processes will be influenced by context in a nested manner, with the discrete context subsumed within the omnibus context.

To maintain a resilient local response to crisis situations, public and private resources need to coordinate procedures and maintain backup plans and redundancies. While organizational routines can both be seen as a source of inertia and inflexibility, they can also be an important source of adaptability and change in crisis situations (Feldman and Pentland, 2003) by guiding behavioral responses. Still, vulnerabilities in many sectors are indirectly associated with dependencies on the specific routines and technologies in use. An example of this is how Norwegian school principals encouraged and succeeded in a rapid transformation to remote learning and digital education during COVID-19 (Lien et al., 2022). A better understanding of how high reliability in infrastructure and organizational routines could influence the behavior and practices of crisis managers during technological breakdown and cascading risks will provide a significant advantage for crisis leadership (Pescaroli and Alexander, 2018).

Compounded, interconnected, interacting, and cascading risks could have a profound effect on critical societal functioning (Pescaroli and Alexander, 2018). Further research is needed to provide a better understanding of how contextual factors will influence crisis managers and how the Sendai Framework for Disaster Risk Reduction could inform disaster risk reduction (Aitsi-Selmi et al., 2015). The operational capacity of local crisis responses in remote geographical areas is increasingly dependent on the reliability of technologies such as internet-based services or satellite systems (Andreassen et al., 2020). In crisis situations, technological breakdown or disturbances can prompt a need to shift to other means of interaction, incl. Low-tech intensive coordination forms. A better understanding of technological limitations, failures and consequences will present important information on factors that could affect the information sharing and coordination capacity of crisis leadership in remote areas such as the High North (Andreassen et al., 2020). Local knowledge and trust in the crisis response units will be important to mobilize local resources and initiative. The prospect of technological failure could present an important element in training and development of local crisis response units to enhance mental readiness, training fidelity, and interoperability of leaders and local resources (Hays and Singer, 1989). To this end we propose the following research and training objective:

> 6: How will technological failures affect inter agency coordination and preparedness to cope with local crisis situations?

5. Team training design

A cornerstone in crisis response involves flexible response to threats, which encompasses a capacity of shifting plans. The flexibility is influenced by individual risk perceptions, skills, competencies, and the resolve of local crisis managers. Selection, training, and organizational culture could influence both risk perception and willingness to take risk. For instance, Johnsen et al. (2016) concluded that a brief eight-hour training session of frontline police officers increased their awareness of risks associated with critical decisions and intentions to act if a critical situation should occur. An interesting finding was that the training effects were more pronounced for unexperienced compared to seasoned police officers. Future research should therefore contribute to identify and explain perceived gaps in preparedness and risk assessment when local crisis leadership is exposed to technological failures.

Following from the above, a next step is to investigate mitigating factors derived from real world crisis situations. Since training studies, including simulator training, are characterized by a high degree of control, there is a need for studies of real-life operations to examine crisis leadership in action in true to life situations with high degree of uncertainty, flexibility, and affect. To gain a better understanding of the contextual aspects of crisis leadership, a potential roadmap to enhance crisis leadership could be to explore different forms of training designs to mitigate the impacts of technological failures including relevance of training, subjective learning effects, change in awareness and potential for behavior change.

Team development interventions is commonly used to describe activities aimed at improving team effectiveness, processes, or skills (Lacerenza et al., 2018). Crisis leadership in remote and complex situations such as in the Arctic, requires local knowledge and skills to successfully operate in an environment with scarcity of resources and infrastructure, multiple independent actors, and limited situation awareness (SA). The coordination processes are commonly planned and formalized as standard operating procedures, mechanisms, or task assignments in position descriptions. The importance of coordination in fast-response organizations has been acknowledged because of the involvement of interdisciplinary teams of specialists and distributed operations (Faraj and Xiao, 2006). Still, lack of resources, technological failures, or various local contextual factors, may challenge standard operating procedures developed for normal situations.

In complex environments the application of formalized plans presents coordination challenges. Crisis situations may call for formal coordination based on analytical decision-making processes but may also invoke improvised coordination mechanisms to maintain flexibility due to task complexity or irrational components in decision making, such as negative emotions. Training is a primary tool for enhancing the competence of local responders to coordinate their actions when faced with uncertainty or emotionally charged decisions. Evidence based team training interventions adopt a structured (i.e., step by step) approach to developing the relevant knowledge, skills, and attitudes that underlie effective teamwork (Lacerenza et al., 2018). To enhance local team leadership and collective performance, one can use structured simulation and training exercises to investigate how team behavior and leadership adapts to a dynamic situation in training or in real-life situations (Lacerenza et al., 2017).

Simulation-based training is widely considered the most effective way of delivering team training (Weaver et al., 2010). Simulation-based training is recognized to improve knowledge, technical skills, and behavioral learning (Cook et al., 2011). Not surprisingly, simulation-based activities have the strongest evidence of effectiveness (Buljac-Samardzic et al., 2020). Technologies in a digital exercise could be set up in a way so that even geographically separated team members may collaborate in a learning session. Remote, but coordinated digital training exercises provide an easy and cost-effective way to assess, train, and develop local crisis response units. The participants' experiences contribute to the task practice environment that may affect the enhanced team coordination in real practice. Advanced simulation technology provides multiple opportunities for developing team coordination skills and competences under realistic circumstances. Participants may receive feedback on their performance, increase their awareness of team dynamics and individual stress reactions (Meynard and Gilson, 2014). For instance, information communication technology (ICT) can be used to connect stationary and virtual teams to demonstrate how task and team based sheared mental models will be positively associated with outcomes in virtual teams (Meynard and Gilson, 2014). Another desirable outcome is that a simulated and recorded exercise will allow identification and evaluation of role acceptance, role flexibility, and decision-making (Wilson et al., 2009). However, one of the main challenges in simulation training is to design specific situations relevant to actual practice and to capture the complexity of real-world incidents in the training experiences (Flin, 1996). An aspect of real-life crisis situations will also be to deal with contingencies, side effects, and the consequences of unforeseen emergencies (Alharthi et al., 2018).

Thus, it is important to plan pedagogies and study whether the technology employed has provided richer interactions between learners, their concepts, and practice (Laurillard, 2008). A promising pedagogical approach to team simulation scenarios would be to utilize an event-based measurement approach that is anchored to a relevant local crisis. Through the systematic introduction of events into training exercises, event-based measurements provide opportunities to observe and learn from specific team and leadership behaviors that occur in response to the event (Fowlkes et al., 1998), for instance to foster diagnostic reasoning, patient management, and practice for surgery in training of physicians.

Teamwork in local crisis management entities could be the passkey to assess and establish a collective understanding in support of a seamless coordination of performance solutions to complex scenarios. However, following the notion that human interaction is central, it also represents a vulnerability factor in crisis management. Therefore, empirical, and systematic evaluation of team training to improve local team behavior is essential to develop successful crisis leadership and a resilient community response. Following a deeper understanding of cognitive and emotional aspects of decision making and team processes, it will be possible to empirically investigate training effects of known individual and team processes affecting crisis response outcomes (Saus et al., 2012).

Flexibility is an example of a core aspect of both individual and team level crisis response. Flexibility in crisis response demands the coordinators to fulfill a wide range of roles related to information sharing, decision-making, and front-end personal command. Role flexibility and role transitions create challenges to crisis responses units. In complex crisis situations team members self-regulatory processes are important (DeShon and Rench, 2009) and role expectations in the form of role acceptance and improvisation will be a key factor in crisis leadership, team coordination and SMM.

During the response process, incident commanders will coordinate and control the situation through specified routines according to their roles, standard operating procedures or tasks lists within the established incident command systems (Bigley and Roberts, 2001). On-scene coordination of a complex emergency response operation will rely on coordinators that fulfil a range of roles related to information sharing, decision-making, and front-end resource command. Understanding of their own and other roles is essential for crisis leadership, team coordination and SMM.

Roles are defined as a set of expectations in connection to a position or fulfilment of an assignment, for instance in fulfillment of responsibilities in security operations (Bartone, 2010). If role expectations are contrary to one's personal or to fellow team members, this may cause intrapersonal or interpersonal conflicts. In unforeseen situations, a role shift by a team member may not be explicitly shared by the team, hampering teamwork processes, or resulting in role flexibility and improvisation (Michaelsen and Sweet, 2008). There is a need to explore how a role improvisation can be defined in terms of role expectations and acceptance and how to handle differences in role acceptance and improvised role shifts.

In acute situations, when operational staff are established, effective crisis leadership may implicate the need to shift roles to facilitate desired outcomes. Role switching is one of the coordination mechanisms for high reliability organizing that involves the reassignment of personnel to different positions within the organization in complex and dynamic environments (Summers et al., 2012). To evaluate and enhance the awareness of team dynamics, effective crisis leadership will rest on collaborative team simulation and training through table-top and simulator exercises. The information, communication technology used to support team interaction and collaboration in emergency scenarios has the inherent capacity to enhance crisis leadership by training of team effectiveness, role acceptance and flexibility for both virtual and face to face situations. Advanced simulation technology provides opportunities for developing NTS under realistic circumstances. Technologies for digital tabletop exercises may also involve virtual teams. From this we propose a need to investigate the challenges facing crisis leadership in achieving shared understanding of team roles and designing team training to support front-end operators working in distributed teams.

Since the availability of on-site simulator training is often very limited, and user costs are high, individual computer-based training may serve as a useful supplement to full scale team training (Saus et al., 2010). In any case, effective feedback and assessment are necessary to enhance training outcomes (Marcano et al., 2019). Simulation and training that focus on coordination of information and expert knowledge among members of a team is an essential part of exercising crisis leadership in complex emergencies. There is a need to explore the most effective strategies that responders with various background can employ in training to enhance the flexibility of a command system. From this we propose the final research and training objective:

> 7: How can emergency management exercises be designed to enhance role understanding and coordination flexibility in response to local crisis situations?

6. Summary

The current paper presents a simplified conceptual roadmap and suggests research questions that could inform, develop, and improve local crisis leadership. Following up from Bavik et al. (2021) we have indicated knowledge gaps in our understanding of how human factor variables and "soft skills" facilitate individual, interpersonal, and inter-agency performance in complex, acute, and protracted crisis situations. Extending previous research on non-technical skills and operational psychology, we allude to a multidisciplinary approach informed by theoretical perspectives from organizational, behavioral, and political science, that can be informed by a mixed methods approach including experimental and qualitative approaches applied to simulation, training, and real-life situations. From a generic model of crisis leadership, we propose seven research questions that can inform local training and development programs. Hence, we propose to examine the full spectrum of crisis response, from individual complex problem solving to frontline team dynamics and assess how local crisis leadership and teamwork respond, to technological breakdowns and contextual risk factors (Roberts et al., 2021).

We strongly believe that a multi-disciplinary approach will contribute significantly to generate new theoretical and applied knowledge. From a theoretical perspective there is a need to gain more knowledge about how local professional and political leaders are influenced by their emotions during crisis situations, and how these emotion regulation strategies influence complex decision making. At the interpersonal level, new theoretical perspectives on team dynamics, role acceptance and role improvisation need to be compared to existing theory of shared mental models in true to life simulation and locally relevant training scenarios. A part of this is to develop evidence-based

TABLE 1 Topics and research questions to extend the empirical basis for assessing and developing local crisis leadership.

Local crisis leadership	Research questions
Complex problem solving	• How will negative emotion induction influence the outcome of complex problem solving in local community response to crisis situations? • How can emotion regulation strategies be useful in complex problem-solving situations that taxes different levels of cognition?
Team interaction and performance	• How can coordinating mechanisms and team processes enhance situational awareness and quality of local decision making in an interdisciplinary crisis response staff? • How will mechanisms and processes of coordination influence local crisis response when coordinating is facilitated by staff versus line? • Can the SMM framework explain possible differences in coordinating mechanisms, team processes and effectiveness between virtual and face-to-face coordination of local crisis response?
Team context and technology	• How will technological failures affect inter agency coordination and preparedness to cope with local crisis situations?
Team training design	• How can emergency management exercises be designed to enhance role understanding and coordination flexibility in response to local crisis situations?

team training procedures that will serve an applied purpose in assessing and developing frontline operators in public and private sectors. At the policy level there is a need to provide evidence-based guidelines to support political decision-makers in dealing with diffuse and uncertain scenarios, producing new guidelines for stress testing organizations and improving resilience to known and unknown threats. The research themes summarized in Table 1, suggest relevant research questions that can inform the training and development of local end-users. An improved understanding of individual and team-based problem-solving capacity in emotionally charged situations will feed back to improve education, training, and performance in frontline operators.

7. Outcomes and consequences

We expect that competent community-based crisis leadership will have a positive impact on the general public's perception of professionalism and competence, thus instilling trust in the emergency services. A better understanding of how local crisis response units attends to complex problem solving and emotional regulation in operational settings, may also provide better advice and recommendations to the general population in safety critical situations (Dasborough and Scandura, 2021). Likewise, by acquiring more empirical information about team interaction and performance this will present an opportunity to communicate best practice advice about barriers and facilitating factors involved in functional team behavior (Roberts et al., 2021). From enhanced team training we expect the explicit focus on simulation and training to be of high relevance for local public and private sector organizations that increasingly rely on distributed work teams, simulations, and online solutions to train their employees or solve their core mission assignments. Thus, this simplified conceptual framework will also have an impact on societal preparedness by providing an empirical basis for selection, education, and training of crisis management teams. Finally, a possible radical outcome of a stronger emphasis on crisis leadership could be a change in the relation between operational dispatch centers and operational front-end operators. This could support a shift from risk management to a stronger emphasis on resilience management (Pescaroli and Needham-Bennett, 2021). A more explicit focus on local crisis leadership could involve more specific performance expectancies, changes in role expectancies as well as increased role acceptance and a renewed scrutiny of training practices and the dynamics of effective crisis leadership.

Author contributions

JE: writing-reviewing and editing, conceptualization, and supervision. AH: writing-original draft preparation, and conceptualization. NA, GB, and RE: writing-original draft preparation. BJ: writing-reviewing and editing, conceptualization. All authors contributed to the article and approved the submitted version.

Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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