Psychology Research and Behavior Management

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ORIGINAL RESEARCH

Teachers Who are Stuck in Time: Development and Validation of Teachers' Time Poverty Scale

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Purpose: Time poverty has been shown to adversely affect individuals' development as well as organizations and countries, which is also a widespread problem among teachers, affecting work performance, mental health, and even the development of students and schools. However, the advancement of education research on time poverty has been stymied by the lack of a validated measure. Therefore, to fill the theoretical gap of time poverty in education and to compensate for the absence of an instrument for measuring teachers' time poverty and the challenges of using objective measures, it is necessary to develop and verify a domain-specific measurement instrument among teachers.

Patients and Methods: An online questionnaire is designed through a Chinese data collection platform (Questionnaire Star). Study 1 and Study 2 are a cross-sectional study included 713 teachers in China and the descriptive statistics, correlation analysis and analyses of exploratory and confirmatory factors are used to develop the Teachers' Time Poverty Scale. Study 3 and Study 4 are a longitudinal study included 330 teachers, while the Time Confusion Tendency Scale and Life Satisfaction Scale is used to verify the measurement tool. SPSS 26.0 and Mplus 8.3 are used to analyze the data.

Results: Teachers' Time Poverty Scale with the single-factor structure exhibits good psychometric properties based on seven items. And teachers' time poverty can negatively and significantly predict life satisfaction and teachers' time poverty can be positively and significantly predicted by time confusion tendency.

Conclusion: Teachers' Time Poverty Scale is a useful tool that can be used in actual investigations to provide empirical support for teachers, schools, and education policy makers.

Keywords: teachers, time poverty, scale development, scale validation, time confusion tendency, life satisfaction

Introduction

There has been a growing concern about the time problems of teachers around the world. It is known that teachers work too long,[1] have time fragmentation,[2] and cannot balance their work and family time well.[3] In other words, teachers often feel that time is not enough and cannot arrange their own time, even gradually losing their ownership of time. Based on scarcity theory and the sociology of time theory, we can regard these feelings of time scarcity as time poverty.[4,5] Poverty has been a frequently discussed topic in various fields and is usually measured by income.[6] This narrow focus on material resources, however, has been challenged.[7] Specifically, with economic growth and increasing material wealth, individuals' happiness has not been improved and income cannot be used to synthetically measure their happiness.[8] In contrast, time as a nonmonetary factor is equally important for improving individuals' well-being and promoting social progress.[9] Recent research published in Nature Human Behavior demonstrates that time poverty can reduce individuals' subjective well-being and creativity, cause mental health problems, and even adversely affect organizations and countries.[9] Therefore, we believe that teachers' time poverty can break their work and family balance, reduce life satisfaction, lead to job burnout,[10] and cause mental health problems (eg, depression

Received: 6 April 2023
Accepted: 12 June 2023
Published: 21 June 2023

and anxiety).[11] It will also affect students' development and school teaching quality.[12] Altogether, teachers' time poverty can be regarded as an important factor affecting the development of teachers, students, and schools.

However, in existing research, there has not yet been a unified definition of time poverty, in particular, there are few studies on time poverty in education. A major reason is the absence of a valid and feasible measure of time poverty. The existing time poverty measurement methods and perspectives are single, which are calculated using the income poverty calculation method.[13] The other methods for measuring time poverty depend on calculating how much time is spent on each activity but neglect the subjective time factor that has a significant impact on individuals' life and work, which may be more important than the objective measure.[14–16] The current measurement methods do not accurately reflect the characteristics of teachers, as there is a lack of effective domain-specific measurement instruments to measure the time poverty of teachers.

Therefore, to fill the theoretical gap of time poverty in education and to compensate for the absence of an instrument for measuring teachers' time poverty and the challenges of using objective measures, it is necessary to develop and verify a domain-specific measurement instrument among teachers. According to scarcity theory and the theory of sociology of time, we first define teachers' time poverty and clarify its internal structure to provide a theoretical framework for developing the scale. Then, based on psychometric theory and common methods for verifying scales,[17] we develop and validate a scientific and effective Teachers' Time Poverty Scale. The results of this study can provide a standardized and education-specific measurement instrument for the actual investigation of teachers' time poverty and provide empirical support for teachers, schools, and education policy makers.

The Concept of Teacher Time Poverty

Due to the diversity of research positions, the definition of time poverty in academia is not clear, but it can be roughly divided into two perspectives. Specifically, the objective perspective emphasizes the amount of time allocated to various activities. For example, there is not enough time to maintain physical and mental health, eat and perform physical activities, obtain education, etc.[3,13,14] Additionally, the subjective perspective emphasizes the subjective experience and feelings, where time poverty refers to feelings about time pressure,[18,19] time urgency,[20] and the feeling that there is not enough time to do what needs to be done.[9,21] Scarcity theory argues that scarcity is a psychological condition in which an individual's needs are not met due to the feeling of scarcity or a real scarcity, and it also believes that scarcity mindset is the real cause of poverty, which can affect decision-making and cognitive abilities.[5] Thus, time poverty refers to time as a limited resource, and both real time scarcity and feeling scarcity refer to a subjective perception of time scarcity.[9] Therefore, based on the scarcity theory, we define teachers' time poverty as the feeling of time scarcity that teachers have too many things to do but not have enough time to complete them. In other words, this definition emphasizes teachers' subjective feelings of time scarcity. The above definition of teacher time poverty supported by scarcity theory provides the theoretical basis for us to further develop the scientific psychometric measurement. Teachers with high time poverty often feel that their time is scarce, and that their time needs are not met. In addition, recent scientific studies have demonstrated that feelings of time poverty can influence individuals' job and life satisfaction,[19] mental health,[11] and creativity.[9] With the rapid pace of work and life, teachers do not have enough time to think, reflect, and complete their tasks, which could negatively affect their well-being, work performance, mental health, etc. In view of this, this study believes that it is necessary to understand teachers' subjective feelings about time poverty from a psychological point of view.

It is worth noting that some studies have identified time poverty as the same concept as time pressure, time urgency, and work-family conflict. We believe that teachers' time poverty is different from these concepts, and before developing a new scale, it is essential to distinguish the target construct from existing constructs that have conceptual overlap. First, time pressure emphasizes the feeling of stress when an individual does not have enough time.[22] In other words, time poverty and time pressure represent different feelings about time. Time poverty can cause or exacerbate time pressure, which is the most important condition for producing time pressure.[23] Individuals with a strong sense of time poverty will experience more time pressure. Second, time urgency perceives that time is limited and tends to accelerate the pace of doing things.[24] Time urgency focuses on the pace of doing things, whereas time poverty highlights the feeling of scarcity when an individual does not have enough time. Last, work-home conflict and time poverty both involve unbalanced time allocation but with a different focus. Time poverty reflects that individuals allocate excessive time to one typology of

time, leaving little time for others. Work-family conflict is essentially role conflict whereby the job demands and time commitment at work interfere with the fulfillment of family roles.[25]

Furthermore, we should clarify teachers' time poverty internal structure to provide a theoretical framework for developing the scale. On the one hand, some studies regard time poverty as a two-dimensional structure (ie, work and family) and are defined as a feeling that there is not enough time to accomplish everything at work or home.[26] On the other hand, other more studies have argued that time poverty is a single-factor structure.[11] The theory of the sociology of time back up this argument and argues that each level of social structure has its own typology of time (ie, cyclic-time, institutional-time, interaction-time, and self-time), and every typology of time can be considered as integrating different levels of social structure in time because of the embeddedness of time, in which time poverty can be transferred to all typology of time.[4] Those who are experiencing time poverty at one typology are likely to increase or reduce their time at another typology to solve the problem, thus further contributing to the feeling of time poverty. The work-family conflict theory, consistent with the theory of the sociology of time, argues that work-family boundaries are permeable, which means that teacher time poverty combines work and family aspects to shape a single dimension.[18] That is, even if teachers leave the classroom, work can still occupy their home time, blurring the boundary between work and family. Therefore, teachers' time poverty does not have to be divided into a specific dimension (work or family), and we regard it as a single-factor structure that can reflect the feeling of time poverty under any domain.

Therefore, based on the scarcity theory, the theory of the sociology of time and work-family conflict theory, this study defines teachers' time poverty from a subjective perspective,[9,21] and regards it as a single-factor structure.[11]

The Measurement of Time Poverty

There have been many measurement methods of time poverty in prior research from both objective and subjective perspectives. Objectively, time poverty is first incorporated into household economic models and calculated in the same way as income poverty.[13] This has indeed been adopted in some studies.[27] However, this method equals time to income and ignores the discrepancy that time is independent of income in nature. Then, time poverty is assessed objectively by measuring how long it takes to complete an activity. For example, Kalenkoski and Hamrick[28] measured time poverty by calculating the number of hours spent eating and drinking and the number of minutes engaged in physical activities. Banwell et al[29] explored the relationship between time poverty and obesity by calculating the frequency of cooking, performing physical activities, and eating fast food. Similarly, some studies divided the types of activities, such as necessary activities (sleep, grooming, etc), committed activities (housework time, childcare time, etc), free activities (minus the remaining time of the first two activities), and then measured their time poverty by the number of hours used for these activities.[14] However, the standard for the classification of activity types has not yet been unified, which can increase the difficulty of this method and decrease the validity of these measurement tools.[30] In addition, the time-diaries method is generally used to measure objective time such as the ones above, which requires researchers not only to calculate carefully how to allocate their time to specific activities but also to weigh the recall of respondents (measurement errors and bias).[15] Furthermore, the time-diaries method is relatively expensive and may be a financial burden for researchers.[31] Altogether, there are limitations to these objective measurement methods.

From the subjective perspective, the research focuses on measuring people's subjective feelings about time and exploring the relationships between time related feelings (eg, time pressure, time perceived, and time value) and mental health. For example, Roxburgh[11] explored the relationship between subjective time pressure and depression. Garling et al[32] explored the relationships between time pressure and stress by asking the participants some questions (eg, "Do you often feel that you do not have enough time?", "Do you have free time?" and "Do you often feel short of time?"). Additionally, other research focuses on measuring subjective feelings about the worth of time. For example, Etkin et al[33] described how conflicting goals or activities during a given period of time can enhance individuals' enjoyment to make them feel more energetic.

From the above, objective measurement methods emphasize the external time structure, that is, the real amount of time occupied by the actual activities. However, as we understand scarcity theory and the theory of sociology of time, lacking objective time is not necessarily equivalent to feeling time poverty. The objective amount of time also needs to be subjectively perceived to affect the individual's cognition, emotion and behaviors.[34] Sometimes subjective measurement can better explain an individual's feelings of time.[16] Taken together, this study measures teachers' feelings of time poverty from the subjective level.

Current Research

To compensate for the absence of an instrument for measuring teachers' time poverty and the challenges of using objective measures, this study aims to develop and validate the Teachers' Time Poverty Scale. Based on scarcity theory and the sociology of time theory,[4,5] this study regards time poverty as a single-factor structure and measures teachers' feelings of time poverty at the subjective level. We conduct with the exploratory factor analysis and the confirmatory factor analysis to develop the scale (Study 1). The proposed solution for validating the scale is by evaluating measures for their concurrent and predictive criterion validity. According to the psychometric method, concurrent validity can be regarded as measuring the correlations between various variables, whereas predictive validity can reflect how well the measure predicts behaviors or states in the future.[17] Thus, we test the psychometric properties and the nomological network of the scale. We design a cross-sectional study to test the concurrent validity, and regard time confusion tendency as an antecedent variable, exploring the correlations between teachers' time poverty and time confusion tendency (Study 2). Next, after a 2-week interval, this study evaluates the test-retest reliability of this scale (Study 3). Finally, to better validate the new scale and reveal the causal relationship between variables, a longitudinal study across time is designed to test the predictive validity with data collected for twice (Study 4). We take life satisfaction (Time 2) as the consequence variable of measuring teachers' time poverty (Time 1) and take time confusion tendency (Time 1) as an antecedent variable to measure teachers' time poverty (Time 2).

Study 1: Development of the Teachers' Time Poverty Scale (TTPS)

We developed this Teachers' Time Poverty Scale based on several principles that could provide support for the content validity of this scale. First, after reviewing the literature, we found that there was no conceptual definition of teachers' time poverty. Therefore, based on scarcity theory, we defined the concept of teachers' time poverty, and the content of the scale's items should be closely related to it.

Second, we also sorted out the existing measuring tools of time poverty from the objective and subjective levels and found that the subjective measurement can better explain an individual's feeling of time.[16,34] Therefore, the items should be able to measure the subjective feelings of teachers (eg, "I feel that I do not have enough time to improve my skills" and "I feel that I do not have enough time with my friends").

Third, most research preferred to divide time poverty into different domains, such as work or family domains.[18] However, teachers' occupational characteristics and information technology had blurred the boundaries between work and family. Additionally, the theory of the sociology of time and work-family conflict theory also argued that all typology of time was embedded, and work-family domains had permeable boundaries.[4,18] Altogether, this study did not consider specific domain factors in developing the scale.

Fourth, some items were learned from Roxburgh's Time Pressure Scale (Cronbach's α coefficient is 0.892), such as "You never seem to have enough time to get everything done".[11] This scale was a single-domain instrument and did not divide fields either.

Finally, to understand the actual situation of primary and secondary school teachers, we conducted simple interviews with teachers, and the content of the interviews provided a good reference for revising these items (eg, "I feel that my teaching hours are often taken up by transactional work").

Taken together, these aspects provide support for the use of well-designed single-factor structure measure in research and practice. Hence, we hypothesize the following:

H1: The single-factor structure of the Teachers' Time Poverty Scale could exhibit good psychometric properties.

Method

Participants

A total of 746 participants were recruited from primary and secondary schools in China. A total of 713 teachers (473 females, 42.77 ± 18.28 years old) were obtained after removing the lie detector questions (eg, work 25 hours a day). The online questionnaire consisted of twelve items and two demographic variables (gender and age). All the data were valid with no missing data and were used for exploratory factor analysis (EFA) and confirmatory factor analysis (CFA).

Procedure

This study was designed as a national survey for primary and secondary school teachers. Data were collected through an e-questionnaire website named "Questionnaire Star" between July 14th and August 10th, 2022, in China. After receiving these permissions from participating schools, we sent questionnaires to the teachers and explained the purpose of this study as well as the ethical principles of scientific research. All participating teachers agreed to participate, and they were free to withdraw from this research at any time. All materials and procedures were approved by the University's Research Ethical Committee of the corresponding author. Furthermore, all the data were first examined with EFA, and these items were initially deleted according to the descriptive statistics, factor analysis, reliability test, etc. After that, we conducted with CFA to delete other items.

Measures

Teachers' Time Poverty Scale

A scale consisting of twelve items that measured teachers' time poverty is developed based on the above discussion. All items measure teachers' time poverty positively with no reversed items and are rated using a 1- to 5-point Likert scale in which 1 = strongly disagree, 2 = disagree, 3 = generally, 4 = agree, and 5 = strongly agree. These scale items can not only reflect the characteristics of teachers but also apply to teachers' time poverty in any situation.

Results

All these data supported the appropriateness of conducting EFA. The detailed analysis results were as follows: the specific result of the test of sphericity was χ^2=9461.722, df = 105, $p < 0.001$, and the KMO index of sampling adequacy was 0.951.[35,36] Because of the factors' correlations, we used oblique rotation which could provide a more accurate and reproducible solution and used principal component analysis (PCA) to reveal the internal structure of multiple items through a few principal components.[37] Additionally, theoretically and empirically, we did not divide the dimensions. Hence, the number of factors to be extracted was set to 1, and the initial eigenvalue was 9.449, which could together explain 62.991% of the total variance of the twelve items. Table 1 showed that each item loaded strongly with a range of 0.693 to 0.843, and the correlations of the twelve items ranged from 0.425 to 0.860 ($p < 0.001$). The twelve items had a Cronbach's α coefficient of 0.958. The means ranged from 3.09 to 3.61, the SD ranged from 0.955 to 1.144, and all of these items exhibited negative skewness and kurtosis.

The CFA was estimated with Mplus 8.3 software using the maximum likelihood estimation, where the fit indices could help evaluating the model adequacy.[38] Specifically, the fit indices included the root mean square error of approximation (RMSEA) in which its value < 0.08 indicated an acceptable fit; the standardized root mean square residual (SRMR) in which its value < 0.5 indicated a good fit; a comparative fit index (CFI) in which a value > 0.95 indicated a good fit; the Tucker-Lewis index (TLI) in which a value > 0.95 indicated a good fit; and the additional χ^2

Table 1 Correlations of Twelve Items and Communalities

	Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Communalities
Q1												0.693
Q2	0.768**											0.788
Q3	0.671**	0.752**										0.823
Q4	0.535**	0.595**	0.666**									0.729
Q5	0.468**	0.549**	0.628**	0.565**								0.753
Q6	0.663**	0.721**	0.690**	0.591**	0.644**							0.828
Q7	0.497**	0.587**	0.636**	0.546**	0.589**	0.655**						0.843
Q8	0.526**	0.597**	0.627**	0.560**	0.623**	0.637**	0.860**					0.843
Q9	0.469**	0.565**	0.576**	0.549**	0.556**	0.611**	0.680**	0.706**				0.769
Q10	0.465**	0.580**	0.618**	0.555**	0.595**	0.612**	0.688**	0.684**	0.677**			0.836
Q11	0.425**	0.523**	0.577**	0.497**	0.540**	0.600**	0.604**	0.590**	0.609**	0.757**		0.797
Q12	0.447**	0.557**	0.600**	0.522**	0.543**	0.574**	0.597**	0.619**	0.585**	0.659**	0.730**	0.793

Notes: **Correlation is significant at the 0.01 level (2-tailed). Extraction Method: Principal Component Analysis.

statistic.[39] In addition, the standardized estimate coefficients loading on item-factors should be considered to be correlations of item-factors in which all items were greater than 0.4 and at a significant level ($p < 0.001$).[40]

The initial model's results of the CFA were as follows: RMSEA = 0.127, CFI = 0.923, TLI = 0.901, χ^2/df (35) = 12.41. The results showed that the initial model fit indices were not ideal, and it was necessary to revise the model. The usual practice was to modify according to the Modification Indices (MI).[41] Because the data were linked, only one parameter could be corrected at a time in the correction process, and we could start from the largest correction index.[41] In addition, when modifications were made according to MI, it should be logical.[42] As a result, when we removed the items, we considered the following aspects: we should choose the largest MI, each topic should be able to reflect the characteristics of teachers, each topic should be closely related to the concept of time poverty, each topic should cover a wide range involving teachers' work, family, life and other aspects to be applied in any situation. Finally, we removed five items, and the final model consisting of seven items exhibited high fit indices, RMSEA = 0.074 < 0.08, CFI = 0.982 > 0.95, TLI = 0.972 > 0.95, χ^2/df (14) = 4.9 and SRMR = 0.098 < 0.5. Figure 1 showed the model for the seven items. The standardized estimates for all items ranged from 0.701 to 0.835 ($p < 0.001$), which indicated that this scale was convergently valid.

Consequently, we obtained a scale consisting of seven items in Table 2. These seven items' results of the test of sphericity were χ^2=2972.812, df = 21, $p < 0.001$, and the KMO index of sampling adequacy value of 0.928. The seven items had a Cronbach's α coefficient of 0.914. The correlations of the seven items ranged from 0.522 to 0.706 ($p < 0.001$), as shown in Table 3. Table 4 showed that the means ranged from 3.09 to 3.65, the SD ranged from 0.982 to 1.101, and the items exhibited negative skewness and kurtosis. The finding of high mean scores was reasonable considering that time poverty among teachers was common and that the mean scores of approximately 3.45 on the 5-point scale indicated no extreme ceiling effects. Finally, we tested the discriminant validities of the seven items. We calculated the average variance extracted (AVE) by teachers' time poverty latent construct from the items used to measure it. According to the recommendations, the AVE should not be less than 0.5.[43] The AVE result in the current study was 0.605, indicating satisfactory convergent validity and providing evidence of discriminant validity.

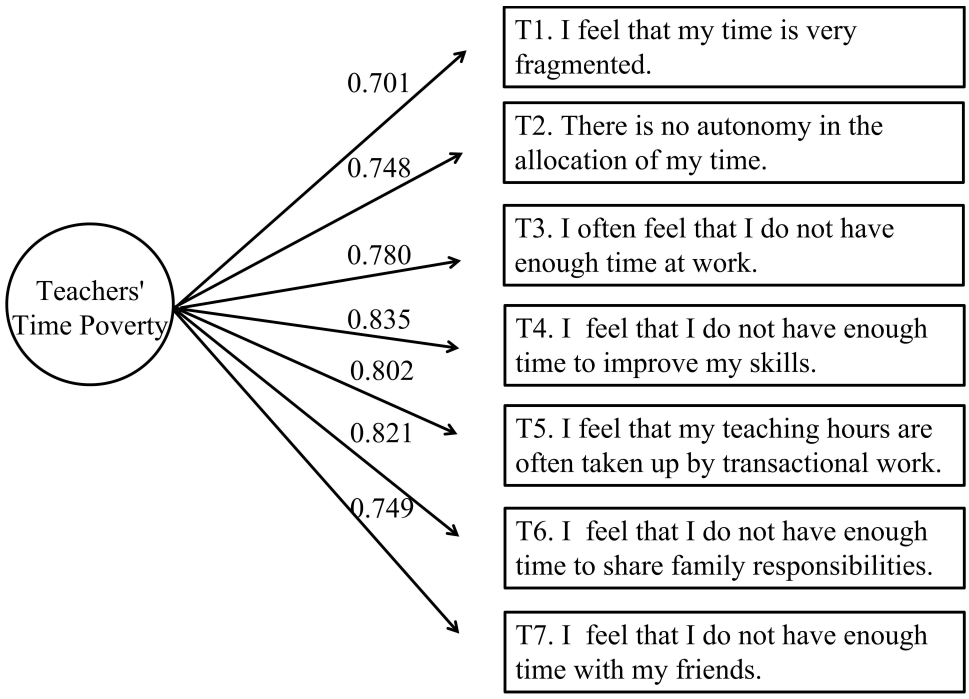

Figure 1 Confirmatory factor analysis.
Note: All standardized coefficients (β) are significant, $p < 0.001$.

Table 2 Teachers' Time Poverty Scale

The seven items measure your attitudes toward your time. Please read each item carefully and are rated using a 1- to 5-point Likert scale in which 1 = strongly disagree, 2 = disagree, 3 = generally, 4 = agree, and 5 = strongly agree.
1. I feel that my time is very fragmented.
2. There is no autonomy in the allocation of my time.
3. I often feel that I do not have enough time at work.
4. I feel that I do not have enough time to improve my skills.
5. I feel that my teaching hours are often taken up by transactional work.
6. I feel that I do not have enough time to share family responsibilities.
7. I feel that I do not have enough time with my friends.

Table 3 Correlations of Seven Items

	T1	T2	T3	T4	T5	T6	T7
T2	0.565**						
T3	0.591**	0.644**					
T4	0.560**	0.623**	0.637**				
T5	0.549**	0.556**	0.611**	0.706**			
T6	0.555**	0.595**	0.612**	0.684**	0.677**		
T7	0.522**	0.543**	0.574**	0.619**	0.585**	0.659**	

Note: **Correlation is significant at the 0.01 level (2-tailed).

Table 4 Means, Standard Deviations and Communalities

Item	Mean	SD	Skewness	Kurtosis	Communalities
T1	3.50	1.090	−0.422	−0.428	0.574
T2	3.09	1.057	−0.012	−0.467	0.631
T3	3.50	1.018	−0.410	−0.187	0.674
T4	3.37	1.061	−0.322	−0.478	0.727
T5	3.65	1.101	−0.527	−0.429	0.683
T6	3.52	1.034	−0.398	−0.203	0.712
T7	3.49	0.982	−0.301	−0.180	0.624

Note: Extraction Method: Principal Component Analysis.

Discussion

Both the EFA and CFA indicate that the single-factor structure of teachers' time poverty exhibits good psychometric properties based on these current items. The purpose of these items is to measure teachers' time poverty in any situation, and hence, we do not set the specific dimension to expand the use of scales. Although some items are deleted because of MI and other aspects mentioned above, we believe that these seven items will lead to a more comprehensive and education-domain measurement instrument for teachers' time poverty.

Study 2: Concurrent Validity

There are many reasons for time poverty, and time management behavior can be regarded as one of the influencing factors.[4,9,11] The theory of the sociology of time argues that the time management behavior is an important factor affecting time poverty, in which poor time management behavior will directly affect the control and allocation of time, and it is easy to produce the subjective experience of insufficient time.[4] Time management behavior refers to the effective planning and control of time resources,[44] and time confusion tendency is one of the important elements of time management behaviors. In daily work, teachers spend too much time dealing with administrative matters, which causes them to shorten the time spent

on one task or perform multiple tasks concurrently, leading to time confusion.[45] In other words, those with a time confusion tendency are highly disordered when completing multiple tasks, and their time rhythm is chaotic in the work or family domains.[44] Although there is no research on the connection between time poverty and time confusion among teachers, through the relationship between time management behaviors and time confusion tendency and the actual situation of teachers' work mentioned above, we can infer that if a teacher has a serious time confusion tendency, they will not effectively plan time resources, and their time rhythm is chaotic, increasing their feelings of time poverty. Thus, we explore the correlations between teachers' time poverty and time confusion tendency. Hence, we hypothesize the following:

H2: Teachers' time poverty is positively correlated with their time confusion tendency.

Method

Participants

A sample of 713 teachers (473 females, 42.77 ± 18.28 years old) was recruited in the same way as in Study 1.

Procedure

To test the validity of the scale, we explored the correlations between teachers' time poverty and time confusion tendency by Pearson correlation analysis. Data collection was conducted in the same way as in Study 1, and the measurement scales were ordered as follows: Teachers' Time Poverty Scale and Time Confusion Tendency Scale.

Measures

Teachers' Time Poverty Scale

The Teachers' Time Poverty Scale (TTPS) is the scale developed in Study 1, and all the aspects remain the same as in Study 1. The scale consists of seven items and is rated using a 1- to 5-point Likert scale in which 1 = strongly disagree, 2 = disagree, 3 = generally, 4 = agree, and 5 = strongly agree.

Time Confusion Tendency Scale

It measures people's time rhythm which can reflect their disordered state when completing multiple tasks at once.[46] This scale is adapted from the Time Management Behavior Scale (TMB)[44] and consists of three items that are rated on a 1- to 5-point Likert scale in which 1 = strongly disagree, 2 = disagree, 3 = generally, 4 = agree, and 5 = strongly agree. The Chinese version has been well validated (eg, Guo et al),[47] and its Cronbach's α coefficient in the current study is 0.745.

Results

The correlations between the variables (teachers' time poverty and time confusion tendency) were presented. As expected, teachers' time poverty and time confusion tendency were related ($r = 2.05$, $p < 0.01$).

Discussion

This study finds that teachers' time poverty is positively correlated with time confusion tendency. Teachers who experience more time confusion tendencies are more likely to have serious time poverty. Various studies have shown that some teachers prefer to organize their schedules.[1] However, time cannot always be controlled by themselves, and they have no autonomy when allocating time.[12] Consequently, teachers' entire schedule will be disrupted, and there will be a tendency toward confusion in time management, leading to time poverty.

Furthermore, we conduct simple interviews with teachers when compiling the scale (Study 1). Most teachers reflect that aside from teaching duties, teachers also have many nonteaching tasks. It can take up teachers' teaching time and cause them to do multiple jobs at the same time. In addition, some teachers are always disrupted by these unplanned work arrangements and cannot arrange their work in an orderly manner. Consequently, these contents of interviews help us understand the results of these data, and simultaneously, correlation analysis can provide data support for this actual situation.

Study 3: Test-Retest Reliability

Teachers' time poverty measures their subjective feelings about time over a period of time. To test the reliability and validity of the scale, this study evaluates the test-retest reliability. Hence, we posit the following:

H3: This scale can exhibit good retest reliability.

Method

Participants

A sample of 348 participants (247 females, 41.59 ± 8.51 years old) was recruited through primary and secondary schools in China. Because of a lie detector test (eg, "There are 23 hours in a day"), a total of 330 teachers (238 females, 41.67 ± 8.57 years old) were retained after the lie detector questions.

Procedure

In Study 1, we obtained a total of 713 samples. After a two-week interval, we asked the same teachers to answer the final version scale, and we collected 635 samples the second time. For the two data collections, we set up demographic variables (eg, "the last word of your name", and "the last four digits of your phone number") to combine the two datasets. We also set up lie detector tests to remove low-quality samples. Consequently, we merged the two datasets and removed low-quality questionnaires with missing data, resulting in 330 samples. Correlation analysis was also conducted between the first and second teachers' time poverty data.

Measures

Teachers' Time Poverty Scale

All the aspects remain the same as in Study 1. The scale consists of seven items and is rated using a 1- to 5-point Likert scale in which 1 = strongly disagree, 2 = disagree, 3 = generally, 4 = agree, and 5 = strongly agree.

Results

This study evaluated the test-retest reliability of the scale, which was 0.665, $p < 0.001$, with the retest Cronbach's α coefficient ranging from 0.913 to 0.929.

Discussion

After a 2-week interval, this retest confirmed that the scale exhibits good retest reliability. Teacher time poverty emphasizes measuring teachers' subjective time perceptions over a period of time. For example, at the end of the semester, due to teaching pressure, teachers have a strong feeling of time poverty. After the final exam, their time poverty is weak without no teaching pressure. As a result, we believe that it is reasonable as the scale measured teachers' time poverty in that way.

Study 4: Predictive Validity

Life satisfaction can reflect the teacher's cognitive assessment of the quality of life, including overall life satisfaction and life satisfaction in specific areas (eg, work, health, family),[48] and life satisfaction is an important index to measure subjective well-being.[7] Although no study has examined the relationship between life satisfaction and time poverty among teachers, some studies have shown that time poverty can negatively impact individuals' subjective well-being.[9,34] Therefore, we can infer that teachers' time poverty has an impact on their life satisfaction, and we take life satisfaction as the consequence variable for measuring teachers' time poverty. Hence, we hypothesize:

H4: Teacher's time poverty can negatively and significantly predict life satisfaction (Part 1).

For the time confusion tendency in Study 2, based on the sociology of time theory, we can also infer that teachers who have a serious tendency toward time confusion will feel more time poverty. Hence, we take time confusion tendency as an antecedent variable to measure teachers' time poverty. Hence, we hypothesize the following:

H5: Teachers' time confusion tendency can positively and significantly predict their time poverty (Part 2).

Method

Participants

A sample of 330 teachers (238 females, 41.67 ± 8.57 years old) was recruited in the same way as in Study 3.

Procedure

To test the predictive validity, we conducted a longitudinal study across time. We used teachers' time poverty (Time 1) and life satisfaction (Time 2) to do regression analysis (Part 1). Similarly, we conducted teachers' time poverty (Time 2) and time confusion tendency (Time 1) to perform regression analysis (Part 2). All other data were valid with no missing data.

Measures

Teachers' Time Poverty Scale

All the aspects remain the same as in Study 1. The scale consists of seven items and is rated using a 1- to 5-point Likert scale in which 1 = strongly disagree, 2 = disagree, 3 = generally, 4 = agree, and 5 = strongly agree.

The Confusion Tendency Scale

This scale[46] consists of three items that are rated on a 1- to 5-point Likert scale in which 1 = strongly disagree, 2 = disagree, 3 = generally, 4 = agree, and 5 = strongly agree, and all the aspects remain the same as in Study 2.

The Satisfaction with Life Scale

It measures general satisfaction with life.[48] It consists of five items that are rated on a 1- to 5-point Likert scale in which 1 = strongly disagree, 2 = disagree, 3 = generally, 4 = agree, and 5 = strongly agree. It has been widely used, and its Chinese version exhibits good validity (eg, Xin et al).[49] The Cronbach's α coefficient in the current study is 0.863.

Results

In Part 1, to examine whether teachers' time poverty could negatively and significantly predict life satisfaction, regressions were conducted with life satisfaction as the dependent variable. The prediction coefficient R^2 of the regression equation was 0.020, β = - 0.117, indicating that the teachers' time poverty could explain their life satisfaction. The simple linear regression equation of the independent variable to the dependent variable was significant, F (1, 328) = 6.596, $p < 0.05$, indicating that teachers' time poverty made an incremental contribution to teachers' life satisfaction.

In Part 2, to explore whether time confusion tendency could positively and significantly predict teachers' time poverty, we assigned time confusion tendency as an antecedent variable to perform regressions. The value of R^2 was 0.055, β = 0.606, F (1, 328) = 19.257 ($p < 0.001$), indicating that the simple linear regression equation of the independent variable to the dependent variable was significant, in which time confusion tendency made an incremental contribution to teachers' time poverty.

Discussion

In Part 1, the study finds that teachers' time poverty can significantly predict teachers' life satisfaction. That is to say, the more time poverty teachers feel, the lower their life satisfaction teachers have. Therefore, reducing teachers' feelings of time poverty may improve their life satisfaction and well-being.

In Part 2, the study finds that the time confusion tendency can be used as a predictor of teachers' time poverty to conduct regression analysis, and the results are significant. Teachers who have a tendency toward time confusion will experience more time poverty.

General Discussion

To compensate for the absence of an instrument for measuring teachers' time poverty and the challenges of using objective measures, we develop and validate a seven-item scale of teachers' time poverty. The results from four studies support the psychometric soundness of the new scale. Specifically, analyses of exploratory and confirmatory factors

suggest an adequate fit of the single-dimensional measurement model (Study 1). To better validate the scale, we conduct a cross-sectional (Study 2) and longitudinal study (Study 4), examining the nomological network. We use life satisfaction as a consequence variable, indicating that teachers' time poverty can negatively and significantly predict teachers' life satisfaction. We use time confusion tendency as an antecedent variable, indicating that time confusion tendency can positively and significantly predict time poverty. This scale demonstrates good test-retest reliability (Study 3). All these results show that the scale is a scientific and effective measurement tool. Taken together, our research fills the theoretical gap of time poverty in education. We enrich time scarcity theory, the theory of the sociology of time and work-family conflict theory, innovatively introduce these theories into teachers' time poverty, expand the research perspective of these theories, and provide empirical evidence for these theories and their effectiveness. We hope that this scale is a useful tool that can be used in actual investigations to provide empirical support for teachers, schools, and education policy makers.

Theoretical Implications

Our research enriches the literature on poverty. Previous research on poverty has primarily concentrated on material poverty and is usually measured by income.[6] However, increasing income does not improve individuals' happiness.[8] In contrast, time is a nonmonetary factor that is important for improving individuals' well-being and promoting social progress.[9] Therefore, exploring the time dimension of poverty helps to deeply understand poverty. This finding is consistent with previous views that material wealth cannot be used to synthetically measure happiness and that time is equally important for individuals, organizations, and society.[8,9] Our study tries to understand poverty in a new way and we not only regard poverty as an economic and social problem but also as a psychological problem that cannot be ignored. Understanding poverty from the perspective of psychology is helpful to dispel many misunderstandings in poverty.

This work enriches research on time poverty and expands the broader area of poverty. Teachers' time poverty is a pervasive and problematic phenomenon around the world that can break teachers' work and family balance, reduce life satisfaction, lead to job burnout, cause mental health problems, and even affect students' development and school teaching quality.[10–12] However, educators have paid little attention to this topic. A major reason is the absence of a valid and feasible measure of time poverty. While economics and management researchers have developed objective measures of time poverty,[13,14] these measures not only require researchers to calculate carefully and weigh the recall of respondents (measurement errors and bias) but also may be a financial burden for researchers.[15,31] We address these limitations by turning the focus to subjective time poverty and developing and validating a scale of perceived time poverty. We complement the subjective time poverty measures and allow researchers to identify differences between the objective time poverty measures and subjective time poverty measures.

Based on scarcity theory, we define teachers' time poverty as the feeling that teachers have too many things to do but not have enough time to complete them, emphasizing teachers' subjective feelings of time scarcity. The emphasis on teachers' time poverty is different from other perspectives concerning time scarcity in economics and management research and we distinguish the focal construct from existing constructs that have conceptual overlap (eg, time pressure, time urgency and work-family conflict), which can help us have a more complete and subtle understanding of time. In addition, our focus on teachers' time poverty is unique in the following aspects. First, we use the scarcity theory to explain the psychology of poverty, provide a new perspective for the explanation of time poverty, and broaden its application in education. Second, the core of teachers' time poverty is discretion in time allocation, which is highly relevant to the sense of time confusion tendency, time control and autonomy and is essential for teachers' work performance, for their life satisfaction, and for mental health.[9,34] Third and relatedly, according to the theory of sociology of time and work-family conflict theory,[4,18] we regard teachers' time poverty as a single-factor structure, which highlights teachers' time poverty in any domain. This term breaks the field limitation, which is different from previous studies.[26] It also enriches both the sociology of time theory and work-family conflict theory and introduces these theories into the education field to explain time poverty's internal structure, adding a new research perspective to these theories.

Practical Implications

To better verify the validity of the scale, this study uses antecedent and consequence variables, designing a cross-sectional and longitudinal study. Our research has practical implications in many aspects. First, by examining the nomological network of

teachers' time poverty within time management behavior and well-being, we corroborate the theory of the sociology of time,[4] the time management behavior (eg, time confusion tendency)[44] and the perspective of subjective well-being, and extend their applications to studying the time poverty in the education field. The results show that teachers' time poverty can significantly predict teachers' life satisfaction. This finding is consistent with previous view that life satisfaction, as an important part of teachers' subjective well-being,[7] can be affected by time poverty.[9,34] Through the application of the scale, researchers could examine a broader set of outcomes of time poverty, including teachers' creativity, work satisfaction, and even mental health. Because our scale emphasizes the subjective dimension of time poverty, we believe that reducing teachers' feelings of time poverty is an important way to protect their mental health. In addition, we provide initial evidence that time confusion tendency can affect teachers' time poverty. The theory of the sociology of time argues that time management behavior is an important factor affecting time poverty.[4] Hence, we infer that the time confusion tendency, as one of the elements of time management behaviors, can positively and significantly predict teachers' time poverty. Our results innovate to confirm this hypothesis, which also provide data support for the conception of time poverty defined by Roxburgh[11] and Zuzanek.[19] Moreover, educators could further adopt our measure to study how time management behavior's other aspects (eg, target setting, time control, time arrangement) together shape teachers' time poverty.

Second, with our newly developed scale of teachers' time poverty, school organizations and policy makers can make wiser decisions concerning the development of teachers, the emotional health of their students and the effectiveness of school teaching quality. Schools can regularly assess teachers' levels of time poverty and change their work schedules accordingly. In addition, given the harm of time poverty, schools could refer to teachers' time poverty status when evaluating the effectiveness of school teaching quality. Teachers' time poverty can directly affect teachers' work performance and students' academic performance.[12] Thus, teachers' time poverty status can be regarded as a dimension when evaluating school effectiveness.

Finally, to alleviate teachers' time poverty and deal with the problems of working too long and unreasonable distribution of working hours, we put forward relevant countermeasures and suggestions from teachers and school administrators.

For teachers, on the one hand, they should adjust their own time management awareness and time management ability to form their own work rhythm and work strategy.[50] On the other hand, teachers should establish a positive stress mindset to deal with their stress.[51] The stress mindset focuses on the nature of stress itself, in which individuals believe that stress has protective effects on outcomes, such as well-being, development, and health (referred to as the "stress-is-enhancing mindset").[52] Teachers with a positive stress mindset, even though they have time poverty, still feel that it is beneficial to improve their focus, thereby increasing their work efficiency and improving work performance.

For school administrators, to intervene in teachers' time poverty, therefore, is to intervene in their work. Too often, proposed recommendations to alleviate teachers' time poverty focus on adjusting teachers' working hours, workload and work intensity.

Firstly, schools should set reasonable limits on the working hours of teachers and scientifically allocate the time spent by teachers in each type of work, especially clarify the teaching working hours and professional development time.[12] Secondly, school administrators should arrange teachers' workload reasonably and adjust their work intensity. Remove some types of work that teachers do, for example, non-teaching work. That is to say, school should reduce the frequency of interference of transactional work to teaching work.[53] In addition, schools can also build a platform for teachers to exchange and share their time management experience, so that they can also learn from others.[54]

Limitations and Future Research

Although this study has proven the validity of the scale, some limitations remain. First, in the longitudinal study, the sample size after combining two datasets is not as large as expected because of the high sample loss rate. This may be related to the mobility of teachers' workplaces, online survey methods, etc. Hence, we can adjust the methods of collecting questionnaires according to the actual situation, and necessarily, we can also give the participants a certain reward in future research.

Furthermore, we use only two variables (antecedent and consequential variables) to test the validity. In future studies, we can add other variables to explore their relationship with teachers' time poverty. For example, Kim et al[55] found that teachers' stress mindset affects their feelings of pressure, which could predict their psychological well-being and professional development.

Data Sharing Statement

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

Ethics Statement

This research was approved by the ethical review committees of Capital Normal University in China. We confirm that the guidelines outlined in the Declaration of Helsinki were followed. The participants of this study were teachers, and only questionnaires were given to teachers, including time poverty questionnaire, time confusion tendency questionnaire and life satisfaction questionnaire. After receiving these permissions from participating schools, we sent these questionnaires to the teachers and explained the purpose of this study as well as the ethical principles of scientific research. All participating teachers agreed to participate, and they were free to withdraw from this research at any time. All materials and procedures were approved by the University's Research Ethical Committee of the corresponding author. The study did not involve human trials.

Acknowledgments

The authors thank all the teachers who participated in the questionnaire in the study. We are also grateful to the editors and reviewers for their contribution to the peer review of this work. Tianyu Liu and Xiantong Yang are co-first authors for this study.

Funding

No funding was received to assist with the preparation of this manuscript.

Disclosure

The authors report no conflicts of interest in this work.

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