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A socio-technical framework for addressing the influence of work time and income on work well being

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Abstract. In contrast to the striking discussion of working overtime in the media, it remains unclear in academic research whether longer work time leads to job burnout and procrastination. Informed by job demands-resources model and challenges-hindrance model, this study examined the role of work hour, time perspective, and income in predicting job burnout and procrastination at work. The results of this survey study, conducted with 223 Chinese employees located in 30 provincial areas, show that work hour only predicted emotional exhaustion. Neither emotional exhaustion nor procrastination at work was predicted by income. Screen time on mobile phone predicted procrastination. By contrast, time perspective predicted both. The findings suggest that work hour can work as resources when it is appraised as supporting personal growth and development, whereas income was not necessarily appraised as supportive of personal development. Additionally, a theoretical perspective of imbalance between effort and reward explained job burnout and procrastination better than their independent effects. Theoretical framework for promoting off-task activities based on context-aware persuasion was proposed. Finally, informed by the philosophy of socio-technical design, this study called for a holistic and collective-oriented perspective to design technical systems for employee.

Keywords. Job burnout; Procrastination at work; Work hour; Time perspective; Income; Job demands-resources model; context-aware persuasion

1 Introduction

Ever since Kenichi Ohmae coined the term “low desire society” to describe the phenomenon of worrying about an uncertain future and unwillingness of possession or consumption in Japanese youth (Ohmae, 2018), as a society shares similar cultural and geographical background with Japan, there has been debate about whether China is slipping into a similar state of low desire society (Shaojie, 2020).

Despite the disagreement over whether China is marching toward a low desire society, the topic of nine-nine-six work schedule (996) and overtime working went viral on social media of China and became an emerging challenge for employers and

government to address (Howsitlike, 2020). 996 work culture was believed to have helped China increase the economy at a rapid speed and will continue to help China make “outstanding achievements like it did in the last four decades” (Howsitlike, 2020). On the other hand, 996 work culture faced the backlash from employees. Chinese tech workers set up a popping-up GitHub project named 996.ICU (refers to “Work by 996, sick in ICU”) to protest 996 schedule (996.ICU, 2019). “996” work schedule means working for at least 60 hours a week and violates the stipulations of labor law of China that the labors shall work for no more than 8 hours a day and no more than 44 hours a week (996.ICU, 2019). CGTN (China Global Television Network) expressed opinion on ‘996’ schedule that “Work to a better life, not ICU”, which to some extent reflected the official position on this issue (Ran, 2019). The media believed that working overtime may result in mental, emotional and physical health, high levels of sleep deprivation, increased anxiety, extreme fatigue, and stress (Howsitlike, 2020). The sudden death of a young female employee at Chinese tech giant Pinduoduo (拼多多) after working long hours past midnight renews the controversy over working overtime. However, as far as we know, there is scant literature in the fields of Human-computer Interaction (HCI) and HWID (Human-Work Interaction Design) that investigated the association of work hours with the phenomenon of low desire, technology use, and how the interaction system in workplace should be designed to address the related challenges. This paper first pioneered this area by examining the impact of work hour and psychological time of a personality on work-related well-being, namely job burnout, and work-related behavior, namely procrastination and time spend on mobile phone. Secondly, this paper challenged both the necessity of 996 schedule and the traditional socio-technical perspective emphasizing that “socio-technical practices create boundaries” since the booming digital economy, technology advances and popularity of staff home (职工之家) are potentially helpful in dissolving the boundary between work and life, ease the conflicts of bounded entities (e.g. employee-employer, workplace-home, work-entertainment-leisure), and enable people to better balance work and non-work responsibilities (Cox et al., 2014). Finally, inspired by the existing staffs’ home that were aimed to improve the work well-being by setting up a sense of being at home, and built on both the findings of this study and socio-technical systems design (STSD) methods (Baxter & Sommerville, 2011), a new pragmatic framework of socio-technical system was proposed to make the work environment more acceptable to employee and deliver better value to employers.

2 Literature Review

In this section, we reviewed the literature about the core concepts and theories upon which the present study based, four predictors (i.e., work hour, income, screen time on mobile phone and time perspective), three dependent variables (i.e., job burnout, procrastination) and their interplay and socio-technical systems design (STSD) methods.

2.1 Job burnout (JBO)

JBO can be defined as “a syndrome of emotional exhaustion, depersonalization, and reduced personal accomplishment that can occur among individuals who do ‘people work’ of some kind” (Maslach & Jackson, 1981). As the definition of JBO implies, the construct of JBO consists of three dimensions including emotional exhaustion (EE), depersonalization (DP) and low personal accomplishment (LPA). EE refers to feelings of being emotionally overextended and exhausted by one’s work (e.g. “I feel emotionally drained from my work”) (Maslach & Jackson, 1981); DP describes an “unfeeling and impersonal response towards recipients of one’s care or service” (e.g., “I feel I treat some recipients as if they were impersonal ‘objects’ ”); LPA describes “feelings of competence and successful achievement in one’s work with people” (e.g., “I can easily understand how my recipients feel about things ”). As far as we know, no existing literature has measured “low desire” at work with valid psychometric scale. However, Ohmae (2018) indicated in his book that low desire was characterized by lack of motivation for marriage, giving birth, owning real-estate, and even working. Blocking progress has been thought to be the behavioral sign of burnout when it was first coined by Freudenberg (1974). In the literature based on empirical evidence, extinction of motivation or incentive has been found to be correlated with JBO (Margaretha, 2019; Tajeri Moghadam et al., 2020) and hence job burnout was selected as the psychological indicator of “low desire” in present study.

As implied by Ohmae (2018), the young Japanese faced higher risk of low desire than their parents. This study posited that younger Chinese suffered more from JOB than older Chinese (Hypothesis 1-1).

2.2 Procrastination at work (PAW)

Procrastination at work refers to the phenomenon of “putting off work related action by engaging in nonwork-related actions during work hours.” (Metin et al., 2016). Although procrastination has been studied enormously, large proportion of research in related field has been conducted to investigate the issue of academic procrastination (Hong et al., 2021; Li et al., 2020; Metin et al., 2016). By contrast, studies about procrastination in the workplace were only at the beginning.

Procrastination was found to be composed of two subdimensions, namely soldiering and cyberslacking. Soldiering refers to offline off-task activity, such as taking long coffee breaks, gossiping or daydreaming. Cyberslacking describes online off-task activity, such as using work-unrelated applications on mobile phone. Cyberslacking was considered a phenomenon emerged with the prevalence of using computers and mobile technology with Internet at work. The development of technology provided employee with more chances of cyberslacking (Metin et al., 2016).

PAW was proved to have relevance for a number of consequential negative outcomes such as lower-salaries, shorter employment duration, likelihood of unemployment, labor productivity, and work performance (Metin et al., 2016; Zabelina et al., 2018). As a result, procrastination might impair employee well-being (Metin et al., 2016). However, brief procrastination may also have positive effects on productivity

and employ well-being (Vitak et al., 2011). Additionally, the factors that may shape and impact procrastination in the workplace remains inconclusive (Hen et al., 2021; Vitak et al., 2011). People in a culture of collectivism and high level of power distance (e.g., Turkey and China) are supposed to be more inclined to have procrastination at work due to being unable to take decisions lack of autonomy to their supervisor (Metin et al., 2016). This study thus posited that procrastination may exist in Chinese employees as behavioral phenomenon of low desire. However, given the age differences of low desire, younger Chinese may have more procrastination activities (Hypothesis 1-2).

2.3 Job Demands and Resources Model (JD-R), work hour and income

The job demands-resources (JD-R) model has been adopted widely as an influential theoretical framework in understanding how job characteristics impact job well-being. According to JD-R, job burnout may develop by following two processes. The first process was determined by job demands (JD) and the second process was determined by job resources (JR) (Demerouti et al., 2001). JD describes “those physical, psychological, social, or organizational aspects of the job that require sustained physical and/or psychological effort”. Job resources, on the other hand, refer to those ‘physical, psychological, social, or organizational aspects of the job’ that “be functional in achieving work goals”, “reduce job demands and the associated physiological and psychological costs”, and “stimulate personal growth and development” (Demerouti et al., 2001, p.501).

According to existing literature, while JD may lead to exhaustion, JR is probably responsible for withdraw behavior and disengagement from work in the long run (Demerouti et al., p. 2001). Among the wide range of job demands, fatigues resulting from time pressure/urgency was thought to be responsible for the relationship between JD and exhaustion (Demerouti et al., p. 2001). In the context of 996 schedule wherein working for long hours was considered as organizational aspect of the job that require sustained physical and psychological effort, this study posited that longer work hours may act as JD and increase job burnout, EE in particular (Hypothesis 2-1). On the other hand, as proved by existing literature (Crawford et al., 2010), the income and welfare may act as JR to decrease procrastination (Hypothesis 2-2).

Mobile phone use during working hours has become prevalent for both work-related and unrelated purposes, this study supposed that mobile phone was also considered as job resources in achieving work goals and reduce job pressure. Therefore, screen time on mobile phone may also predict JBO and PRO (Hypothesis 2-3).

2.4 Challenge and Hinderance Demands Model (CHD) and Time Perspective (TP)

In addition to work hours, some researchers argue that the impact of job demands on work well-being (e.g., exhaustion) may be moderated by how JD was appraised (Crawford et al., 2010). JD-R was later on updated and extended with CHD

theory regarding appraisal of stressors to explain the inconsistencies in relationships between demands and engagement in literature. According to CHD, job aspects that were considered as hinderance job demands (HJD) may lead to emotional exhaustion due to being appraised as impediment to personal learning, development, and growth. By contrast, job aspects that were considered as challenging job demands (CJD) may also play a motivational role and “good” stressors, and hence were appraised as supporting employees’ growth and development. Different with the prediction of JD-R, CJD thus implied that the prediction of work hour to work well-being varies depending on how work hour was appraised. When long work hour was appraised as impediment to personal development, it will increase exhaustion. On the other hand, when long work hour was considered as CJD, it may decrease exhaustion.

In present study, the appraisal of work hour was examined using time perspective (TP). TP originally refers to “the totality of the individual’s views of his psychological future and psychological past existing at a given time” (p. 75). TP reflects individuals’ “dispositional tendencies to use and overuse particular temporal perspectives, developing trait-like temporal biases” (Stolarski et al., 2020). Five dimensions of TP was defined by Zimbardo and Boyd (1999): Past-Positive (PP) refers to warm and sentimental view of the past, Past-Negative (PN) reflects negative and aversive view of the past, Present-Hedonistic (PH) refers to orientation on immediate pleasure and little consideration of future consequences, Present-Fatalistic (PF) refers to the feeling of little control over one’s life, an attitude of helplessness, and Future refers to striving for future rewards and goals.

TP has been proved to be associated with burnout and procrastination. Young people with high level of procrastination were more pessimistic and negative about past events, felt hopeless and helpless, and were less focused on future plans than their counterparts with low and medium level of procrastination (Zabelina et al., 2018). In sum, this study hypothesized that subdimensions of TP can predict JOB and PRO (Hypothesis 3-1). By contrast, balanced time perspective buffers against the burnout and increases job satisfaction (Akirmak & Ayla, 2019) (Hypothesis 3-2).

According to CHD, challenges tend to be appraised as stressful demands that have the potential to promote mastery, personal growth, or future gains. Examples of challenges include demands such as a high workload, time pressure, and high levels of job responsibility. Employees tend to perceive long work hour as opportunities to learn, achieve, and demonstrate the type of competence that tends to get rewarded. The mechanism underpinning challenging job demands (CJD) was supported by effort–reward imbalance model (ERI) (Siegrist et al., 1997; Van Vegchel et al., 2005). Working overtime and time pressure are two of the six sub-dimensions of effort scale in ERI Questionnaire. Reward consists of three underlying sub-dimensions, including money, esteem and security/career opportunities. According to ERIM, JBO was determined by the imbalance between efforts and rewards. As extrinsic ERI hypothesizes, health is a function of imbalance between extrinsic effort and reward. High extrinsic effort and low reward increase the risk of poor health (Van Vegchel et al., 2005). An review study showed that 5 out of 6 studies about the relationship between ERI and burnout found an association between ERI and job-related well-being, wherein risk for exhaustion increased with high effort and low reward (Van Vegchel et

al., 2005). In present study, informed by extrinsic ERI hypothesis, we posited that JBO and PAW was the results of longer worktime and low family income(Hypothesis 3-3).

2.5 Socio-technical Systems Design (STSD) Methods

In this study, socio-technical system design (STSD) method refers to an design approach that take into account both individual, family, organizational and social factors(Baxter & Sommerville, 2011). In line with the idea of social design, STSD aims to develop and design artifact for the public good and interests rather than merely for individual interests(Dell & Venkatesh, 2012). Given the emphasis on family in tradition of China, this study posited that the success of STSD also depends on the extent to which the families of employee were considered. It is important for solving the problems related to low desire society since the problems uncovered in this study were rooted in China, which was normally seen as a collectivism-oriented society and recently highlighted its' outlook for "common prosperity"(Insights, n.d.). As a result, compared with the traditional user-centered method (UCD), the STSD in this study was grounded on a "holistic design" perspective arguing that "all aspects that influence the future use situation should be developed in parallel" and "one person or team should have the overall responsibility for the integration of all aspects"(Gulliksen et al., 2003). Additionally, the traditional HCI methods have focused on the individual interests from requirement analysis to evaluation of system. By contrast, this study strives for a collective-oriented methodology focusing on the stakeholders within the organization and society. We posited that if 996 harms the experience of employee, it will not only have detrimental effect on employee, but also on the organization, family, community and the whole society.

3 Materials and Methods

3.1 Data Collection and sampling

Participants (N=223; age mean [M]=30.2, standard deviation [SD]=4.7, Max=57, Min=22; male=106, female=117) were recruited from Wenjuanxing (问卷星) online survey service platform. They were located in 30 different provincial areas. Eighty-seven worked in Tier 1 cities (i.e., Beijing, Shanghai, Guangzhou, Shenzhen) in the past one year, 92 worked in Tier 2 cities (Capital cities of provinces or autonomy areas), 34 worked in Tier 3 cities, and the rest worked in counties or countryside. As showed in Table 1, the majority of participants were employed by private enterprises (111), followed by state-owned enterprises (46), government or public institutions (38), foreign enterprises (27) and self-employed (1).

Table 1. Distribution of participants by employers

Employed by	Number
Private enterprises	111
State-owned enterprises	46

Government or public institutions	38
Foreign enterprises	27
Self-employed	1

3.2 Measures of independent variables

Work hour per week (WHPW) were calculated based on responses of two self-report questions about their normal work days and work hours per day in the past one year.

Household income (HI) was collected by one self-report item, “How much was the combined gross income of all members living together of your household”. Effort–reward imbalance index (ERI_I) was calculated by the ratio of WHPW to HI.

In effort to examine the impact of use of technology on job well-being and the construct validity of cyberslacking as one dimension of procrastination, the screen time on mobile phone (STMP) was collected with one self-report item (i.e., “How much time did you use your mobile phone on average in the past one year”).

TP was measured using 25 items from the Chinese version of Time Perspective (Chen, 2016), which is adapted from the English version of TP by Zimbardo & Boyd (1999). It included five sub-components of TP: past-positive (6 items; e.g., ‘Familiar childhood sights, sounds, smells often bring back a flood of wonderful memories’, Cronbach’s $\alpha = .75$), past-negative (7 items; e.g., ‘Painful past experiences keep being replayed in my mind’, Cronbach’s $\alpha = .81$), present-hedonic (4 items; e.g. ‘I do things impulsively’, Cronbach’s $\alpha = .81$), present-fatalistic (3 items; e.g. ‘It doesn’t make sense to worry about the future, since there is nothing that I can do about it anyway’, Cronbach’s $\alpha = .64$), future (5 items; e.g. ‘I keep working at difficult, uninteresting tasks if they will help me get ahead’, Cronbach’s $\alpha = .56$). Cronbach’s alpha values for the subscales were .57–.77 in Chen (2016). Participants responded to each item on a five-point Likert scale ranging from 1= ‘very uncharacteristic’ to 5 = ‘very characteristic’.

DBTP

$$= \sqrt{(oPN - ePN)^2 + (oPP - ePP)^2 + (oPF - ePF)^2 + (oPH - ePF)^2 + (oF - eF)^2}$$

Finally, balanced TP was measured using Derivation from the Balance Time Perspective (DBTP), which was introduced by Stolarski et al. (2011). “o” refers to the ‘optimal’ points on each of these subdimensions of TP, and “e” means ‘empirical’ scores on each of these subdimensions of TP. “e” points were derived from P. Zimbardo & Boyd (2008). The ‘e’ point is 4.6 for Past-Positive (90th percentile), 3.9 for Present-Hedonistic (80th percentile), 4.0 for Future (80th percentile), 1.95 for Past-Negative (10th percentile), and 1.5 for Present-Fatalistic (10th percentile).

3.3 Measures of dependent variables

JBO was measured using 9 items (‘I feel burned out from my work’.) from the Emotional Exhaustion subscale JBO by (Maslach & Jackson, 1981). Cronbach’s alpha

values was .85 in the sampling of this study. Participants responded to each item on a five-point Likert scale ranging from 1 = ‘very uncharacteristic’ to 5= ‘very characteristic’.

PAW was measured using 12 items from the Procrastination at Work Scale (Metin et al., 2016). It included two sub-components of PAW: soldiering (8 items; e.g. ‘When I work, even after I make decision, I delay acting upon it’, Cronbach’s $\alpha = .88$), cyber-slacking (4 items; e.g. ‘I spend more than half an hour on social network sites’, Cronbach’s $\alpha = .82$). The scale was translated into Chinese by the researcher of present study and Chinese version was presented to participants in combination with the original English version. Participants responded to each item on a five-point Likert scale ranging from 1= ‘very uncharacteristic’ to 5= ‘very characteristic’.

4 Results

4.1 Descriptive data

Table 2. The descriptiveness of independent and dependent variables

	M	SD	Min	Max
WHPW	47.6	9.1	30	91
HI	228	157	0	100 ¹
ERI_I	10.1	9.3	1.0	72.0
STMP	342.9	142	30	810
TP_PAN	2.8	0.7	1.3	4.7
TP_PAP	4.1	0.6	1.7	5.0
TP_PRF	2.7	0.9	1.3	4.7
TP_PRH	2.4	0.8	1.0	4.3
TP_F	4.1	0.4	2.4	5.0
DBTP	2.55	.70	.6	4.7
JBO_EH	2.4	0.7	1.1	4.4
PRO_SO	2.2	0.8	1.0	4.6
PRO_SL	2.6	1.0	1.0	5.0

Notes: WHPW refers to Work hour per week; HI refers to Household income; ERI_I refers to Effort–reward imbalance index; STMP refers to screen time on mobile phone; TP_PAN refers to past-negative of time perspective; TP_PAP refers to past-positive of time perspective; TP_PRF refers to present-fatalistic of time perspective; TP_PRH refers to present-hedonic of time perspective; TP_F refers to future of time perspective; JBO_EH refers to exhaustion of job burnout; PAW_SO refers to soldiering of procrastination at work; PAW_SL refers to slacking of procrastination at work.

¹ In thousand

As showed in Table 2, the average WHPW was 47.6 hours and significantly higher than the stipulations of labor law of China ($t(222)=5.98, p<.01$); The average HI was 228 thousand RMB; The average STMP was 342.9. Among the five subdimensions of TP, TP_PAP and TP_P were significantly than other three subdimensions ($t_{TP_PAP-TP_PAN} (222)=19.4, p<.01$; $t_{TP_PAP-TP_PRH} (222)=25.3, p<.01$; $t_{TP_PAP-TP_PRF} (222)=18.9, p<.01$; $t_{TP_P-TP_PAN} (222)=20.2, p<.01$; $t_{TP_P//TP_PRH} (222)=24.3, p<.01$; $t_{TP_P//TP_PRF} (222)=19.0, p<.01$). The differences between subdimensions of TP and rating scores of TP_PAP alongside TP_P indicated that the participants experienced more positively in the past and were future-oriented. The average rating score of JBO_EH was significantly lower than the neutral level value of 3 ($t(222) = 12.9, p<.01$), which indicated that did not suffer from serious problem of emotional exhaustion and extinction of motivation. Finally, the average rating scores of PRO_SO ($M=2.2$) and PRO_SL ($M=2.6$) also indicated that the participants did not have serious phenomenon of putting off work related action.

4.2 Difference tests

Independent samples T tests were conducted to examine the differences of variables between younger (younger than 30 years old, $N=106$) and elder employee ($N=117$) . The results showed that young employee had significantly longer STMP ($t(221) = 2.7, p < .05$), higher level of TP_PAN ($t(221) = 2.6, p < .05$), higher level of TP_PRH ($t(221) = 2.3, p < .05$), higher level of JBO_EH ($t(221) = 3.8, p < .01$), higher level of PRO_SO ($t(221) = 3.7, p < .01$), and PRO_SL ($t(221) = 2.2, p < .05$), and lower level of TP_F (see Table 3). Hypothesis 1-1, 1-2 were supported.

Table 3. The differences of variables between younger and elder employees

	< 30 years	>=30 years	<i>t</i> values
WTPW	48.14	47.46	0.54
HI	21.21	23.95	-1.3
ERI_I	10.88	9.34	1.2
STMP	370	318	2.7**
TP_PAN	2.93	2.67	2.6**
TP_PAP	4.03	4.15	-1.7
TP_PRF	2.82	2.61	1.7
TP_PRH	2.56	2.32	2.3*
TP_F	3.98	4.13	-2.5*
DBTP	2.61	2.50	0.76
JBO_EH	2.58	2.22	3.8**
PRO_SO	2.39	2.01	3.7**
PRO_SL	2.78	2.50	2.2*

Notes: WHPW refers to Work hour per week; HI refers to Household income; ERI_I

refers to Effort–reward imbalance index; STMP refers to screen time on mobile phone; TP_PAN refers to past-negative of time perspective; TP_PAP refers to past-positive of time perspective; TP_PRF refers to present-fatalistic of time perspective; TP_PRH refers to present-hedonic of time perspective; TP_F refers to future of time perspective; JBO_EH refers to exhaustion of job burnout; PAW_SO refers to soldiering of procrastination at work; PAW_SL refers to slacking of procrastination at work.

4.3 The prediction of JBO and PRO by WHPW, HI, ERI_I, STMP and TP

Table 4. The linear regression analysis of JBO and PRO by WHPW, HI, ERI_I, STMP and TP

Predictors	JBO_EH			PRO_SO			PRO_SL		
	Beta	R ²	t	Beta	R ²	t	Beta	R ²	t
WHPW	.14	.02	2.1*	.05	.002	.69	.09	.008	1.3
HI	-.12	.01	-1.8	-.11	.013	-1.7	.02	.00	.25
ERI_I	.16	.03	2.4*	.13	.02	1.9	.07	.004	.97
STMP	.11	.01	1.7	.15	.02	2.3*	.29	.08	4.4**
TP_PAN	.62	.38	11.7**	.50	.25	8.6**	.42	.18	6.8**
TP_PAP	-.13	.02	-2.0**	-.18	.03	-2.7*	-.27	.07	-4.2**
TP_PRF	.54	.29	9.5**	.44	.19	7.2**	.41	.17	6.6**
TP_PRH	.55	.30	9.7**	.54	.29	9.5**	.44	.19	7.2**
TP_F	-.37	.14	-5.9**	-.44	.19	-7.2**	-.35	.12	-5.5**
DBTP	.30	.09	4.7**	.24	.06	3.6**	.26	.07	4.1**

Notes: WHPW refers to Work hour per week; HI refers to Household income; ERI_I refers to Effort–reward imbalance index; STMP refers to screen time on mobile phone; TP_PAN refers to past-negative of time perspective; TP_PAP refers to past-positive of time perspective; TP_PRF refers to present-fatalistic of time perspective; TP_PRH refers to present-hedonic of time perspective; TP_F refers to future of time perspective; JBO_EH refers to exhaustion of job burnout; PAW_SO refers to soldiering of procrastination at work; PAW_SL refers to slacking of procrastination at work.

Linear regression analysis was conducted to examine the predictors of JBO and PRO. The results showed that WHPW significantly predicted emotional exhaustion of JBO ($\beta = .14, t = 2.1, p < .05$), whereas it failed to predict soldiering and slacking of PRO ($\beta = .05, t = .69, p > .05$; $\beta = .09, t = 1.3, p < .05$). Hypothesis 2-1 was partly supported. HI did not predict JBO and PROs ($\beta = -.12, t = -1.8, p > .05$; $\beta = -.11, t = -1.7, p > .05$; $\beta = .02, t = .25, p > .05$). Hypothesis 2-2 was not supported. STMP did not predict JBO_EH ($\beta = .11, t = 1.7, p < .05$), whereas it significantly predicted PRO_SO and PRO_SL ($\beta = .15, t = 2.3, p < .05$; $\beta = .29, t = 4.4, p < .01$) Hypothesis 2-3 was partly supported. ERI_I significantly predicted emotional exhaustion ($\beta = .16, t = 2.4, p < .05$) but failed to predict PRO_SO and PRO_SL ($\beta = .13, t = 1.9, p > .05$; $\beta = .07, t = .97, p > .05$). Hypothesis 3 was partly supported. JBO, PRO_SO and PRO_SL were significantly predicted by the five subdimensions of TP. While past positive (TP_PAP) and future

(TP_F) decreased the risk of JBO, PRO_SO and PRO_SL, past negative, present hedonic and present fatalistic increased the risk of them. DBTP significantly increased the risk of JBO, PRO_SO and PRO_SL.

5 Discussion

While the discussion about phenomenon of working overtime and its impact on work well-being, health and life quality went viral in the media of China, there is a scant academic literature on this topic to provide empirical evidence for the related controversies and remedies. Additionally, whether the widely used theories of JD-R and CHD also apply to explaining the phenomenon of JOB and PRO remains inconclusive. Based on the survey data of 223 Chinese employee located in 30 provincial areas and aged from 22-57, this study contributed to the line of research on the related topics by answering four major research questions: 1) Whether Chinese employees, younger ones in particular, are facing the challenges of low desire society as their Japanese counterparts (Hypothesis 1-1, 1-2); 2) Whether JD-R is correct in positing that the work hours positively correlate with job burnout and procrastination (Hypothesis 2-1), and income decrease the job burnout and procrastination (Hypothesis 2-2); 3) Whether the use of technology (i.e. STMP) was considered as job resources and contribute to the job burnout and procrastination (Hypothesis 2-3). 4) Whether CHD is correct in suggesting that the appraisal of time (i.e. TP), balanced TP and phone use may predict the job burnout and procrastination (Hypothesis 3-1, 3-2, 3-3). While most of the hypotheses of this study were supported by the results, some failed to get supporting evidence. In the sections below, the results and implications of the findings were discussed

5.1 Low desire in Chinese youth

While the participants in this study did not face high risk of JOB and PRO on average, the younger participants were more inclined to have problems related to low desire. Although this result supported the hypothesis informed by Ohmae (2018), it was unexpected given the staggering economy of Japan in which the theory of low desired society is rooted. China reaped one of the fastest economic development in the past four decades and the success of economy was reflected on the low level of emotional exhaustion and off-work activities in this study. However, differences between ages indicated that the young Chinese may not harvest the achievement of society as their parents. Chinese under 30 witnessed the booming economy of China and hence were supposed to be more positive on past than their parents who suffered from the shortage of material and poverty to some extent. However, the results of this study indicated that the Chinese society needs to divert some attention from the issue of economy development to the issue of declining positiveness of experience. The higher level of present hedonic and lower level of future among young Chinese echoed the phenomenon of 'little but certain happiness' (小确幸, xiao que xing in Pinyin). Problems including the surging price of real-estate, cost of raising kids, unevenly distributed educational

resources, hopelessness of living better than their parents and disparity of income may help explain their higher level of emotional exhaustion, soldiering and slacking at work.

5.2 Income as job resource and reward

JD-R implied that income and welfare may act as job resources to motivate employee to achieve hard goals and decrease procrastination (Demerouti et al., 2001). However, the result of present study failed to support the argument of JD-R. The positive prediction of emotional exhaustion by ERI_I, instead partly echoed the argument of ERI that high effort and low reward increases JBO (Van Vegchel et al., 2005). Although JD-R proposed that work well-being (i.e., JBO in this study) relies on two factors, namely demands and resources, an interactive theoretical framework highlighting the role of imbalance between effort and reward fit the results of this study. Despite the finding that decreasing work hour and increasing income did help reducing emotional exhaustion at work, what really needed from the stand point of employer is to find a golden ratio of ERI_I, the hard line of income and ceiling of work hours. Additionally, the failure of ERI_I in predicting procrastination suggested that the subjective emotional exhaustion can be addressed to some extent by adjusting the ratio of work hour to income or simply decreasing the work time, whereas such attempt will not work for reducing the off-work activities during working hours. Frequent and long-during off-work activities are undoubtedly harmful for work productivity. Chinese employers are facing the challenges of how to reduce the off-work activities in the context that decreasing work time and increasing income helped little.

5.3 Work hour and appraisal of time

One interesting finding of this study is that TP explained bigger variance in both JBO and PRO than the self-report work hours, supporting the correlation between TP and PRO (Gupta et al., 2012; Zabelina et al., 2018). However, this study was in line with the finding of Zabelina et al. (2018), instead of Gupta et al. (2012), that past negative increase the risk of PRO. This result indicated that the investment of return on improving appraisal of work time may reap more benefits than simply decreasing the work hours. Measures to help decrease experiences of past negative experience, present fatalistic, present hedonic, imbalance between dimensions of TP and increase past positive experience alongside future experience will work for reducing emotional exhaustion and off-work activities. According to CJD, reasonably appraisal of work time also plays a motivational role and “good” stressors. When worktime was appraised as supporting employees’ growth and development, it helps reducing JBO and PRO. It would be helpful to spare some worktime to support employee’s growth and development by extending lunch hour, offering training program, organizing activities for fun, developing expertise, increasing mental and physiological health. Power nap after lunch was not unusual in many Chinese enterprises, which may be appraised as supporting employees’ growth and development.

5.4 Implications for designing interventions

A review study distinguished four types of procrastination interventions, including self-regulation, cognitive behavioral therapy, other therapeutic approaches, and new developments in the realm of concentrating on individuals' strengths and resources (van Eerde & Klingsieck, 2018). Among the various interventional methods, time management was designed in the form of setting goals and monitoring time in effort to organize work to accomplish tasks effectively and efficiently. Despite the failure of screen time on mobile phone in predicting emotional exhaustion, it was found to be effective in predicting the two components of procrastination in this study. This finding hence supported the construct of procrastination with cyberslacking as one component. This finding also paved an avenue for future interventional practices to use mobile phone as the platform of implementing context-aware interventions. Time management was adopted widely as an intervening method in existing literature to tackle the problem of procrastination. Screen time limits were designed to reduce the overuse problem and regulate time spent on mobile phone. However, it's an open question over the negative versus positive effect of using mobile phone in the workplace (Vitak et al., 2011). One possible solution is following the idea of setting limits for screen time with time limits during work hours. For instance, changing the screen color to grey scale to reduce the engagement to contents on mobile phone implicitly when screen time exceeds the limit. On the other hand, this study showed that emotional exhaustion was significantly associated with procrastination. Interventions aiming at managing time may work better in combination with emotional designs and activities. Off-work activities with fun for short time may function as a cheap perk that makes employee "feel like valued professionals who are paid for their output rather than harried wage-earners who must account for every minute of their time" (Beyerstein, 2015). Chinese tech companies have actually realized the significance of allowing for "off-work activities" with workplace amenities like free afternoon tea and snacks, napping room, treadmill, showering room, Yoga room, table tennis, and eye exercise (认识百度, 2021). Despite being considered as cut-rate bribery to "induce workers to put in more hours with cheap incentives, instead of paying them better wages" (Beyerstein, 2015), the results of present study suggested that effort in designing off-task activities may make employee to appraise work time as opportunities for personal development more than just for company development. With the increased capacity of artificial intelligence, providing personalized off-task activities based on detecting the mental and physiological status was potential for overcoming or mitigating the negative effect of JBO and PRO on work well-being and eventually on work productivity.

5.5 A framework for context-aware persuasion

The prediction of procrastination by screen time on mobile phone and time perspective suggests that screen time on mobile phone and time perspective can be potentially used as contextual factors to predict and manage procrastination in the workplace. Besides, this paper thus proposed an architecture for designing context-aware persuasion based on mobile device with three layers of context-aware components including context

acquisition, procrastination inference, and persuasion dialogue. Figure 1 illustrated the proposed architecture.

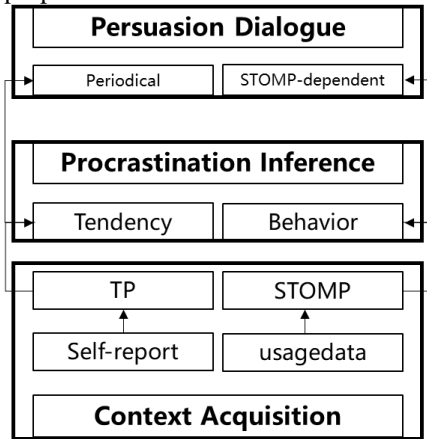


Fig. 1. The architecture for context-aware persuasion of procrastination. TP means time perspective, STMP means screen time on mobile phone

At the layer of context acquisition, the data of time personality and screen time on mobile phone are acquired via self-report questionnaire manually and usage logging tool automatically. Both iOS and Android offered APIs of screen time. For instance, the screen time of all applications and individual applications can be acquired with UsageStats in Android system.

At the layer of procrastination inference, the tendency of procrastination is predicted based on the results of self-report questionnaire of time personality. The initial threshold value of risking procrastination can be determined by the “e” points (P. Zimbardo & Boyd, 2008). By contrast, the behavior indicator of procrastination is based on the screen time in everyday life. The initial threshold value of risking procrastination can be inferred based on the average screen time over the past one week.

At the layer of persuasion dialogue, risk of procrastination tendency is notified periodically at the beginning and adjusted according to users’ feedback on the frequency of notification (e.g., shorten the period of notification when one user indicated that the notification is too frequent). Risk of procrastination behavior is notified depending on the real screen time which is acquired via usage-related APIs. An alert dialogue will pop up to remind user that he/she will delay work when the screen time exceed the threshold value.

5.6 A framework for socio-technical system

The failure of work hour and income in predicting individuals’ JOB and PRO suggested that there are probably other impacting factors. Informed by the perspectives of STSD and socio-technical approach (Abdelnour-Nocera & Clemmensen, 2018), this study proposed a social-technical framework for addressing the issue of low desire (STDLD). In general, STDLD is a holistic and collective-oriented design method

echoing the “need for more research papers is the development of the holistic framework itself”(Campos et al., 2015).

At empathy phase, not only the employees’ needs should be investigated, the needs of colleagues, employers, families, community should also be taken into account. As a result, persona, a popular way of describing requirements of user is not valid anymore since it focuses only on the needs of individual user. This study proposed a new way of describing target user: people. People is a group of humans that may be impacted by the wellbeing of employee. For example, the pain points can be co-shaped by other people in the physical and social environment surrounding the individuals.

At definition phase, the problems to be solved should not merely of the employee. Instead, the organisation, family, living community should be taken into account. For example, the goal of designing HCI system should consider how other people may contribute to the solution and may be influenced by a solution.

At creation phase, a group of people should participate in the design. However, the participants and their way of participating in the process of creation is different from the traditional participatory design method. In STDLD, the stakeholders should include a group of “persona” who will design the technical system with the goal of improving their experience as a group of people and reducing the negative experience by solving the problems caused by inappropriate interactivity among them.

At the phase of prototype and evaluation, the people should design the system for all not only for themselves and how their positive experience may impact others’ experience should be evaluated. STDLD thus call for a new way of evaluating the experience of design. For example, the feeling of other employee and families should be considered when one employee feel comfortable with the system and are willing to work long hour.

6 Conclusion

Despite witnessing the booming economy of China, this study found that young Chinese faced higher risk of low desire than elder Chinese due to longer work time, negative experience of past, hedonic experience of present, fatalistic experience of present, lack of future goal. The results extended JD-R and CHD theories with highlights on designing off-work activities to make work time appraised as opportunities for personal development and growth.

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