ICT-Driven Work Engagement Interventions in Work-From-Home: The Mediating Role of the Need for Relatedness

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Abstract

During the COVID-19 pandemic, organizations across the world implemented mandatory work-from-home policy. The policy had a detrimental impact on the work engagement of the employees as there was a prolonged dependence on ICT-mediated communication for all interactions. In response, organizations had to implement ICT-driven interventions to address the problem of dwindling work engagement levels. In view of enhancing intervention effectiveness, this research examines the satisfaction of need for relatedness as the psychological mechanism underlying the relationship between ICT-driven interventions and intellectual, social and affective dimensions of work engagement. We develop and test our mediation model in a cross-organizational study of 167 employees. Results show that need-for-relatedness mediates the relationship between intervention intensity in fostering interactions and work engagement of the employees. In addition, the perceived social support in the team negatively moderates the relationship between intervention intensity and the satisfaction of need for relatedness. Our results have implications for designing and implementing ICT-driven interventions in organizations planning large-scale work-from-home adoption.

Keywords: Work-from-Home, ICT-driven Interventions, Work Engagement, Self-determination theory, Need for Relatedness, Perceived Social Support.

1 Introduction

During COVID-19, many organizations, particularly in the knowledge industry, adopted the mandatory work-from-home (WFH) policy using ICT-mediated communication (Kniffin et al., 2021). However, the prolonged dependence on ICT-mediated communication resulted in a decrease in employee work engagement levels (Mosquera et al., 2022; Singh & Verma, 2021). In response, many organizations have undertaken ICT-driven work engagement interventions to address the problem of engagement (Fallon, 2020). Given the massive scale and the resource intensiveness of such interventions, there is a need for research on ways to improve the effectiveness of interventions. In this direction, this study shows that the intervention effectiveness on work engagement is contingent on the extent of fulfilment of the basic psychological need for relatedness of the employees.

Humans have an innate basic psychological need for relatedness for optimal functioning in all domains of life, including work (Baumeister & Leary, 1995; Ryan & Deci, 2000). Communication at the workplace plays an important role in the satisfaction of need for relatedness. One of the prominent modes of workplace communication today is through ICT-mediated communication. However, ICT-mediated communication does not fulfill the need for relatedness to the same extent as face-to-face interaction (Sacco & Ismail, 2014).

ICT-mediated communication has gained mainstream importance for organizations in the context of COVID-19 pandemic. During COVID-19, governments in many countries mandated business and industry lockdowns (Chong et al., 2020; Kniffin et al., 2021, Lim, 2021). Faced with the challenge of business continuity, organizations asked their employees to undertake mandatory work from home (WFH). The impact of WFH adoption is far-reaching to the extent that some jobs are predicted to go remote permanently (Stych & Greer, 2020).

WFH is a special case of telework wherein employees are mandated to work from home due to social distancing rules in the pandemic. In WFH, employees work only from home, while telework includes other remote work settings such as while travelling or on vacation. Traditionally, telework involves the choice of the employee, whereas mandatory WFH means that employees do not have a choice due to changed organizational policy. Before the pandemic, telework was not used extensively practice (Kossek & Lautsch, 2017). This is because telework entails a perceived lack of control for the managers on the teleworking employees and, thus, the corresponding monitoring costs. Further, telework was an option given to employees who could benefit from the policy. Thus, while telework does come with advantages of improved job autonomy and work-life balance (Allen et al., 2015), employees forced to work from home are faced with unique challenges of social distancing and loneliness (Kniffin et al., 2021). To this end, there is a need to review the current telework literature in the context of COVID-19 and WFH (Wang et al., 2021).

In WFH, the social interaction takes place entirely through ICT-mediated communication channels. Here, ICT serves a social function wherein it influences the employees by affecting their interactions and social communications (Wang et al., 2020). The quality of communication in ICT-mediated communication is inferior in comparison to face-to-face communication (Walther, 2011; Walther et al., 2015). This phenomena was acutely evident during the COVID-19 pandemic (El-Zoghby et al., 2020; Mosquera et al., 2022). As a result, WFH employees face a loss of social connections and social support.

We argue that the overdependence on ICT-mediated communication in WFH has led to a perceived loss of social support, which has essentially thwarted the satisfaction of need for relatedness of the employees, causing a negative impact on their work engagement.

In response to the dwindling engagement levels of the WFH employees, many organizations have undertaken ICT-driven work engagement interventions which intend to enable and foster social interactions (Fallon, 2020; Singh & Verma, 2021). A variety of interventions have been used in organizations such as town hall meetings, virtual catchups, online games and quizzes (Newman & Ford, 2021).

The overarching research objective of this study is to explore the psychological mechanism underlying ICT-driven interventions and individual-level work engagement. This knowledge can then be used to make these interventions more effective in addressing the loss of engagement. We examine the psychological mechanism underlying the relationship between ICT-driven interventions and the work engagement of employees. According to self-determination theory (SDT), the need for relatedness is one of the basic psychological needs for the optimal functioning of individuals (Ryan & Deci, 2017). We contend that the effectiveness of ICT-driven work engagement interventions in WFH is contingent on the satisfaction of need for relatedness of employees. In other words, the satisfaction of need for relatedness mediates the relationship between the interventions and work engagement.

Overall, we examine the mediating role of satisfaction of need for relatedness, and moderating role of perceived social support on the effect of ICT-driven work engagement interventions on the satisfaction of need for relatedness of WFH employees. The focus is on full-WFH employees as ICT-driven interventions were implemented by organizations during COVID-19 period wherein WFH was mandatory. We present a conceptual framework that can help organizations prepare and counter the challenge of the lack of relatedness while working from home and improve the engagement levels of employees.

2   Theoretical Background and Hypotheses

The advancement of ICTs and availability of high internet speed are the key drivers of the rise of teleworking (Allen et al., 2015). ICT enabled the quick switch to WFH in the wake of business lockdowns due to COVID-19 pandemic (Kniffin et al., 2021). In turn, WFH has become the dominant context that extends the effect of ICT usage on work characteristics and employee outcomes.

ICT usage in telework has two roles: (1) Human-ICT interaction for accomplishing task aspects (e.g., using Google/Git-hub to address technical aspects of work) and (2) ICT-mediated communication for addressing social and relational aspects of work (e.g., using WhatsApp/Signal/Telegram to connect with colleagues) (Wang et al., 2020). ICT-mediated communication refers to the use of ICT medium for interactions and social connections with others at work, rather than for accomplishing tasks. In WFH scenario, ICT-mediated communication has a major impact on relational aspects of work as all the social and interpersonal interactions are mediated through ICTs.

ICT-mediated communication is associated with weakening of social relations (Siampou et al., 2014; Wang et al., 2020). This is because the employee interaction through ICT-mediated communication suffers from lack of important social cues such as body language, contextual information, and other non-verbal cues (Walther, 2011; Walther et al., 2015). Overall, there is a general concern of loss of social support in telework due to a decrease in level of interactions with others (Olszewski & Mokhtarian, 1994; Sahoo et al., 2022). These problems have become acute due to the mandatory nature of WFH wherein employees are forced to use ICT-mediated communication for all their work interactions. In sum, the prolonged dependence on ICT-mediated communication for all work-related interactions had led to the loss of social support and increased need for relatedness.

2.1   Need for Relatedness

Human beings have an innate, powerful, and fundamental need for relatedness, which refers to a desire for meaningful and significant interpersonal relationships (Baumeister & Leary, 1995). According to SDT, the optimal functioning of human beings, in terms of work performance and well-being, is contingent on the satisfaction of three basic psychological needs - autonomy, competence and relatedness (Deci et al., 2017, Ryan & Deci, 2000). The satisfaction of need for relatedness is contingent on two criteria. First, there should be frequent interactions with the relevant people. Second, individuals should perceive that the relationships are stable and enduring in the foreseeable future, and that there is authentic affective concern in the interpersonal relations. The study focusses on the satisfaction of need for relatedness as it is affected in the pandemic era.

According to SDT, the need for relatedness is extremely pervasive and it exists in all domains of life including work (Ryan & Deci, 2017). This is because work is an important domain in many people's lives as they spend significant time and energy at work. In simple words, individuals seek to satisfy the need for relatedness in work domain. This need gets satisfied when people feel as a part of a group, feel connected to significant others, and are able to build close relations (van den Broeck et al., 2016). It has been found to be responsible for prosocial tendency, and fulfilment of this need leads to emotional well-being (Callea et al., 2019).

In this article, we contend that the underlying reason for the weakening of social relations in WFH is the thwarting of the satisfaction of need for relatedness. In WFH, there is a lack of frequent social interactions and deterioration in the quality of social interactions, which leads to thwarting of the satisfaction of need for relatedness for employees. This, in turn, has an adverse impact on work engagement (Deci et al., 2017).

2.2 Work Engagement

Engagement is defined as "the harnessing of organization members' selves to their work roles; in engagement, people employ and express themselves physically, cognitively, and emotionally during role performances" (Kahn, 1990; p. 694). A fully engaged employee shows psychological presence in the role, which involves being attentive, connected, integrated, and focussed on the performance of the role (Saks, 2017). While engagement has been a top priority for organizations, it has become a critical success factor during the pandemic (Lim, 2022).

While there has been research attention to telework and engagement, there has been little progress on work engagement in teleworkers. The limited research on the topic indicates that telework has a negative relationship with social support and work engagement (Sardeshmukh et al., 2012).

2.3 Need for Relatedness and Work Engagement

According to SDT, when the basic psychological needs of an employee is satisfied, it leads to more autonomous forms of work motivation and this consequently has a positive impact on work performance, work engagement and well-being; on the other hand, when the satisfaction of basic psychological needs is thwarted, either due personal factors or environmental factors, the motivation is more controlled rather than autonomous, and there is negative spill over effect on employee performance and work engagement (Deci et al., 2017). In the COVID-19 context, when the satisfaction of need for relatedness of the employees is thwarted due to mandatory WFH, social distancing restriction, and prolonged dependence on ICT-mediated communication, there is a negative impact on the employee work engagement. This decrease in work engagement in COVID-19 is widely observed phenomena and organizations are attempting to improve the engagement levels through ICT-driven work engagement interventions.

An integral feature of engagement is the aspect of connectedness with work and with relevant others at work (e.g., team members, supervisors). The aspect of connectedness is brought out explicitly in the ISA model of engagement (Soane et al., 2012). In this model, work engagement is viewed as construct with three facets – intellectual, social, and affective engagement.

ISA engagement model is the operationalization of the need-satisfaction framework of engagement wherein employee's engagement depends on the availability of psychological resources like meaningfulness, psychological safety and psychological availability (Anthony-McMann et al., 2017). The advantage of using the ISA model is that in addition to the well-

identified cognitive and affective aspects of engagement, this model also focusses on the social dimension of engagement, which reflects the importance of presence of positive relations at work (Toth et al., 2022).

Intellectual engagement refers to the cognitive dimension of engagement. One of the primary requirements of an employee being engaged in a work role is that the person applies oneself cognitively in performing the work. The intellectual component of engagement captures the extent to which the individual can apply one's cognitive resources towards the task performance in the given work role. An increase in the satisfaction of need for relatedness leads to positive affect (Baumeister & Leary, 1995). Increased positive affect in turn enables the usage of cognitive resources in the work role. Hence, we argue that there is a positive impact of the satisfaction of need for relatedness on intellectual engagement.

H1a: There is a direct positive relationship between the satisfaction of need for relatedness and intellectual engagement.

Social engagement refers to the connectedness aspect of engagement. Connectedness with relevant others in the work environment is a central feature of the work engagement (Kahn, 1990). For instance, relationships with supervisors and team members have been considered as the antecedents of engagement (Saks, 2006). The ways in which the employee interacts with team members and others in the workplace influences the social engagement at work. Work in today's world entails extensive interaction and collaboration (Toth et al., 2022). Hence, a key challenge that a modern workforce faces is related to sustaining relationships (Ashford et al., 2018). Hence, social engagement is a vital facet of work engagement. An increase in satisfaction of the need for relatedness indicates the strengthening of interpersonal relationships with relevant others, like supervisor and team-members (Baumeister & Leary, 1995). Hence, we argue that an increase in satisfaction of the need for relatedness has a direct positive impact on social engagement.

H1b: There is a direct positive relationship between the satisfaction of need for relatedness and social engagement.

Affective engagement refers to the positive affect requirement of engagement. Positive affect enables an individual to better utilize their physical, intellectual, and social resources (Fredrickson, 1998). The satisfaction of need for relatedness makes the individual feel connected to relevant others. An increase in relatedness leads to positive affect, while a decrease is linked to negative affect (Baumeister & Leary, 1995). Thus, we argue that an increase in satisfaction of the need for relatedness leads to positive affect, which in turn has a positive impact on the affective engagement.

H1c: There is a direct positive relationship between the satisfaction of need for relatedness and affective engagement.

2.4   ICT-driven Work Engagement Interventions

In response to employee issues in WFH, organizations are attempting to address the work engagement by implementing a host of ICT-driven work engagement interventions (Fallon, 2020; Singh & Verma, 2021). ICT-driven work engagement interventions have been categorized based on their effects on the individuals (hedonic and/or eudaimonic effect), and on the interpersonal (social) aspects (Riva et al., 2012). We focus on interpersonal effect of ICT-driven work engagement interventions, wherein the intervention is directed to enhance the interactions and the connectedness of people in the organization.

The interpersonal aspect of work engagement interventions holds relevance in the current WFH context. The category comprises of those interventions which focus on facilitating connectedness between employees on individual, team, as well as organizational level. A primary challenge in the implementation of such interventions is to create a strong sense of community while working with spatial distancing (Riva et al., 2012), which was not easy even in the pre-pandemic era. In WFH, the intensity of the challenge has increased drastically, given the physical isolation of employees from each other and the organization. The social and interpersonal interventions try to mitigate the effect of physical separation by focusing on decreasing emotional and psychological separation. The evidence of these interventions can be seen in various forms, such as town hall meetings, virtual catchups, online games and quizzes (Newman & Ford, 2021).

Periodic virtual informal interactions between employees have been found to increase the relatedness among employees (Singh & Verma, 2021). These can be done through activities (or initiatives) like weekend get-together, catchup meetings, or virtual drinks on tools such as Zoom and other similar channels. Another instance is to ensure effective management communication through these interventions which increase job satisfaction in teleworkers (Ilozor et al., 2001). This can be done through initiatives such as virtual town hall meetings, where the organizations leadership addresses the employees. Other initiatives include health related periodic virtual events or sending regular updates to employees relating to health tips. These have been found to motivate employees (Greasley et al., 2012). Organizing online gaming events on different platforms or even simpler ones on email threads or other communication channels such as WhatsApp can also help in increasing employees to connect with their co-workers (Ellis et al., 2008). Signing-up employees to wellness programs and courses on different online platforms to boost mental health are also part of such interventions (Gubler et al., 2017). Organizations employ techniques such as story-sessions where employees meet virtually to discuss and share personal and lived experiences which contribute to wellbeing at workplace (King et al., 2020).

The interventions being attempted by organizations are aimed to increase the social interactions with relevant others (Singh & Verma, 2021). In WFH, where the employee is physically separated from the workplace and the co-workers, such an increase in social interactions tends to enhance their perception of social support available in the workplace. Further, the interventions where focus is on increasing social support are likely to improve the satisfaction of need for relatedness (Van den Broeck et al., 2008). Hence, we argue that intervention intensity has positive impact on the satisfaction of need for relatedness.

H2: There exists a direct positive relationship between intervention intensity and the satisfaction of need for relatedness.

In theory, such interventions drive work engagement through changes in job resources and personal resources (Bakker & Demerouti, 2007, 2017; Halbesleben, 2010). The changes in job and personal resources, and the satisfaction of work-related needs have been proposed to mediate the relationship between work engagement interventions and work engagement (Knight et al., 2019). Since interventions are directed towards improvement of work engagement, intervention intensity has a positive impact on the satisfaction of need for relatedness, and the satisfaction of need for relatedness has a positive impact on intellectual, social, and affective dimensions of engagement, we contend that the satisfaction of need for

relatedness mediates the relationship between intervention intensity and dimensions of work engagement.

H3a: The satisfaction of need for relatedness mediates the relationship between intervention intensity and intellectual engagement.

H3b: The satisfaction of need for relatedness mediates the relationship between intervention intensity and social engagement.

H3c: The satisfaction of need for relatedness mediates the relationship between intervention intensity and affective engagement.

2.5 Perceived Social Support

Social support is essential in the optimal functioning of employees at work. It has been shown to be an important job resource at the workplace (Bakker et al. 2014) and it plays a significant role in the satisfaction of need for relatedness (Fernet et al., 2013)

As discussed earlier, the excessive usage of ICT-mediated communication in WFH leads to the weakening of social support. Organizations intend to bolster social support through work engagement interventions as it is pivotal in long-term WFH implementation (Khor & Tan, 2022). The perceived social support enables desirable online social interactions which tends to satisfy their need for relatedness. According to Bavik et al. (2020), social support tends to enhance social interactions over ICT, leading to satisfaction of the need for relatedness. In the pandemic, social support has been a crucial element in helping the employees deal with the challenges of WFH. If the employee already perceives strong social support in the team, the need for relatedness is fulfilled. In this case, the role of interventions in satisfaction the need for relatedness reduces. Hence, we hypothesize:

H4: Perceived social support negatively moderates the relationship between intervention intensity and the satisfaction of need for relatedness.

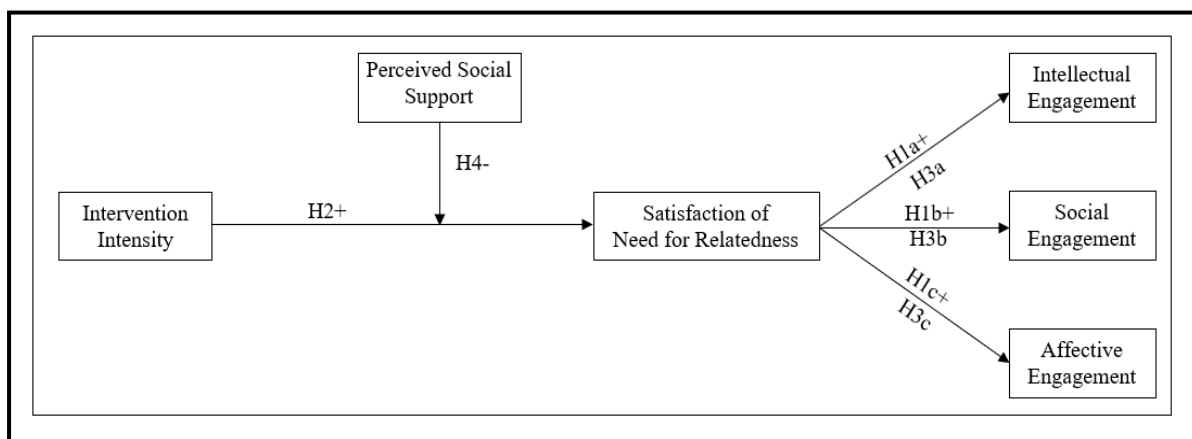Figure 1 below presents the conceptual model.

Figure 1. Conceptual Model

3 Method

We have theorized that the impact of ICT driven work engagement interventions on employee work engagement would depend on the satisfaction of need for relatedness and perceived

social support of the employee. We are using CB-SEM as these are unobserved conceptual constructs and we are trying to estimate mediation effects (Hair & Sarstedt, 2019). The constructs have been measured through standardized scales from existing literature, wherein they are conceptualized as latent factors rather than composites (Hair & Sarstedt, 2019).

3.1 Sample and Data Collection

The study required employees who were in organizations with mandatory WFH policy. Towards this end, convenience sampling was used wherein the participants were identified through professional networks of the researchers. The data was collected by sending emails to over 800 professionals working in organizations that have implemented WFH. The participants primarily belonged to the individual contributor and middle management roles. They were contacted in the month of June 2020, at a time when COVID-19 pandemic was at peak, state policy of social distancing was enforced, and organizations were using mandatory WFH policy. The email listed the objective of the study. We received a total of 167 completed responses, which provided a response rate of 20.88%. This sample size is considered adequate for structural equation modelling (Wang & Wang, 2019). The demographic information of the participants is present in Table 1.

Item	Category	Frequency	Ratio
Gender			
	Male	122	73.05%
	Female	45	26.95%
Age			
	20-30	48	28.74%
	30-40	93	55.69%
	40-50	18	10.78%
	50+	8	4.79%
Education			
	Post-graduate	165	98.80%
	Higher	2	1.20%
Total Work Experience			
	<5	34	20.36%
	5-15	92	55.09%
	15+	41	24.55%
Experience in the current firm			
	<5	116	69.46%
	5-15	48	28.74%
	15+	3	1.80%
WFR experience			
	Regularly	13	7.78%
	Often	47	28.14%
	Sometimes	49	29.34%
	Rarely	44	26.35%
	Never	14	8.38%
Co-occupants			
	0	8	4.79%
	1-3	117	70.06%
	4-7	37	22.16%
	7+	5	2.99%

Table 1. Demographic Characteristics of the Respondents

The sectoral composition of the participants was: IT Services - 31.37%, IT Consulting - 15.69%, Banking and Insurance - 11.76 %, Energy - 5.88% and others (Telecommunication, Healthcare, Retail, NGO etc.) - 35.30 %.

We also collected data on the participants' previous telework experience and the number of people with whom they share their homes as these factors are likely to influence the employees satisfaction of need for relatedness and engagement levels (Kniffin et al., 2021).

The questionnaire was prepared on the Qualtrics software and shared with the participants through an anonymous link to maintain their privacy and confidentiality. The questionnaire measured the responses on a 7-point scale where participants marked 1 for "strongly disagree" to 7 for "strongly agree". The 7-point Likert scale was used to enable more variance among responses (Podsakoff et al., 2003).

3.2   Variable Measurement

In this section, we discuss the variables used to operationalize the constructs in our study. Intervention Intensity captures the strength of the ICT-driven work engagement initiatives targeted towards developing relationships among co-workers. To measure this, we adapted from the scale developed by Nielsen et al. (2000). Organizations had implemented the interventions to increase the social interactions at the team level which had been reduced to a great extent due COVID-19 enforced work from home policy. Thus, in simpler terms, the aim of interventions was to provide opportunity for social interactions at the team level. The scale by Nielson et al. (2000) is used for is used to measure the opportunity for developing relationships at the workplace and contains three items. This scale was adapted by us to measure the opportunity for social interactions at work from home. Representative items include "My organization encourages communication amongst employees". To measure perceived social support, we adapted from the four-item scale by Liu et al. (2011). A representative item from the scale is "My team is supportive of each team members' individual perspectives." To measure the satisfaction of need for relatedness, we adapted from the six-item scale by Sheldon et al. (2001). A representative item from the scale is "At work, I can talk with people about things that really matter to me." To measure work engagement, we have used the scale developed by Soane et al. (2012). The scale has nine items, with three items for each dimension of the work engagement variable - intellectual engagement, social engagement, and affective engagement. Representative items include "I pay a lot of attention to my work", "I share the same work values as my colleagues", and "I feel positive about my work".

The first three control variables in our study are age, gender, and education. We also controlled for total work experience as it can affect the individual capabilities to manage the social relations at the workplace. Further, we controlled for the experience in the current firm as it can affect the social relationships formed in the organizations. Long-term interaction with co-workers can increase the opportunity to develop friendly relationships in the workplace. We further controlled for previous teleworking experience as it can affect the teleworker's capabilities to manage workplace relationships. Finally, we controlled for the co-occupants (number of people they share their home with) as the satisfaction of need for relatedness can also be affected by family or friends in the work environment's immediate surroundings. Age, work experience, tenure, and telework experience were measured as continuous variables, while number of co-occupants were measured in discrete numbers.

3.3 Addressing Common Method Variance

This study was susceptible to common method bias (CMB) because it is a cross-sectional correlational study wherein data was collected at one instance using online survey (Podsakoff et al., 2003). We analysed the data using the common latent factor (CLF) test with a specific bias construct blue marker to address this issue (Fuller et al., 2016). Blue Attitude is 4-item construct that captures the respondent's tendency to respond extreme (strongly agree) or moderate (agree or somewhat agree). This construct is not expected to correlate with other latent factors in the model. Hence, any common variance between the factors is likely to be due to a common method bias.

	Variable	Mean	S.D.	1	2	3	4	5	6	7	8	9	10	11	12	13
1.	Age	-	-													
2.	Gender	-	-	-.17*												
3.	Education	-	-	.26**	.01											
4.	Work Experience	-	-	.85**	-.23**	.08										
5.	Tenure	-	-	.26**	-.04	.01	.33**									
6.	WFH Experience	-	-	-.14	.00	.04	-.18*	.09								
7.	Co-occupant	-	-	.17*	.00	.06	.19*	.16*	-.02							
8.	Intervention Intensity	1.01	0.74	.07	-.12	.14	.02	.08	-.05	.00	(.70)					
9.	Perceived Social Support	0.69	0.50	.03	-.10	-.09	.06	.04	-.06	-.01	.46**	(.69)				
10.	Satisfaction of Need for Relatedness	2.48	0.92	.06	-.06	.07	.05	.08	-.03	-.09	.78**	.63**	(.87)			
11.	Intellectual Engagement	2.53	0.68	.05	-.02	.05	.04	-.09	-.04	-.08	-.02	-.29**	.19*	(.91)		
12.	Social Engagement	1.95	0.89	.06	-.12	.00	.06	-.10	-.07	.01	.03	.31**	.19*	.37**	(.83)	
13.	Affective Engagement	1.92	0.97	.20*	-.13	.16*	.18*	.00	-.07	.11	.47**	.26**	.51**	.30**	.31**	(.92)

Note. Number of Respondents = 167. Age, Work Ex, Tenure, WFH Ex and Co-occupants were measured as continuous variables. *p < 0.05, **p < 0.01. Reliabilities (Cronbach's alpha) are in parenthesis.

Table 2. Descriptive Statistics

We did a common method bias test (Simmering et. al., 2014). Here we compared the unconstrained common method factor model (chi-square = 534.826; df = 682) to the zero-constrained common factor model (chi-square = 793.192; df = 382). The chi-square difference test between the two models was significant (p<0.001). This indicates that there is a significant CMB which needs to be accounted.

Then we ran the equal-constrained test to check if the CMB is evenly distributed across factors. The chi-square difference test between constrained (chi-square = 827.42; df = 387) and unconstrained model (chi-square = 774.776; df = 353) was significant indicating unevenly distributed bias.

Hence the latent factor scores were imputed while keeping the blue factor in the measurement model. This effectively parcels out the shared bias with the blue attitude construct. The imputed latent factors were then used in the path model.

3.4 Reliability and Validity of Measures

The reliabilities of the constructs are presented in Table 2 (in parenthesis). In the reliability test, all the constructs have Cronbach's alpha value above the recommended range of 0.70 (Nunnally, 1994). However, the alpha value for perceived social support lies on the boundary of the range. Next, we measured the validity of the constructs using the confirmatory factor analysis (CFA). The analysis was done using the AMOS version 22 software. One item from perceived social support scale was dropped due to poor loading, and the reliability was improved after dropping the item against the minimum threshold value of .60 (Hair et al., 2019). The reliability values shown in Table 2 are after dropping the item. The new model was reanalysed to confirm the model fit. The hypothesized model provided a good fit to the data ($\chi2$/d.f. = 1.51; n.s.[1]; RMSEA = 0.055; CFI = 0.90, SRMR = 0.06) (Kline, 2015). Finally, we proceeded to confirm the convergent and discriminant validity of the measures (Table 3). The convergent validity of constructs intervention intensity and perceived social support are borderline. One of the possible reasons for this could be different interpretation of questions by participants.

|	Variable	CR	AVE	1	2	3	4	5	6
1.	Intervention Intensity	.68	.42	.65					
2.	Perceived Social Support	.67	.40	.46	.64				
3.	Satisfaction of Need for Relatedness	.86	.51	.75	.64	.71			
4.	Intellectual Engagement	.90	.76	.15	.04	.38	.87		
5.	Social Engagement	.84	.64	.12	.37	.30	.48	.80	
6.	Affective Engagement	.89	.73	.44	.31	.60	.44	.41	.85

Table 3. Composite reliability, average variance explained, and squared correlations

4 Results

The means, standard deviations and reliability and correlations between measured variables have been presented in Table 2. Intervention intensity was significantly positively related with the satisfaction of need for relatedness and affective engagement. Further, the satisfaction of need for relatedness had significant positive correlation with the three dimensions for work engagement – intellectual, social and affective engagement. Thus, these significant correlations provide a preliminary support to the hypotheses.

To analyze the path model and test our hypotheses, we used AMOS software (Version 22). The results of the structural equation modelling (SEM) analysis are presented in Figure 2.

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[1] n.s. - Not significant
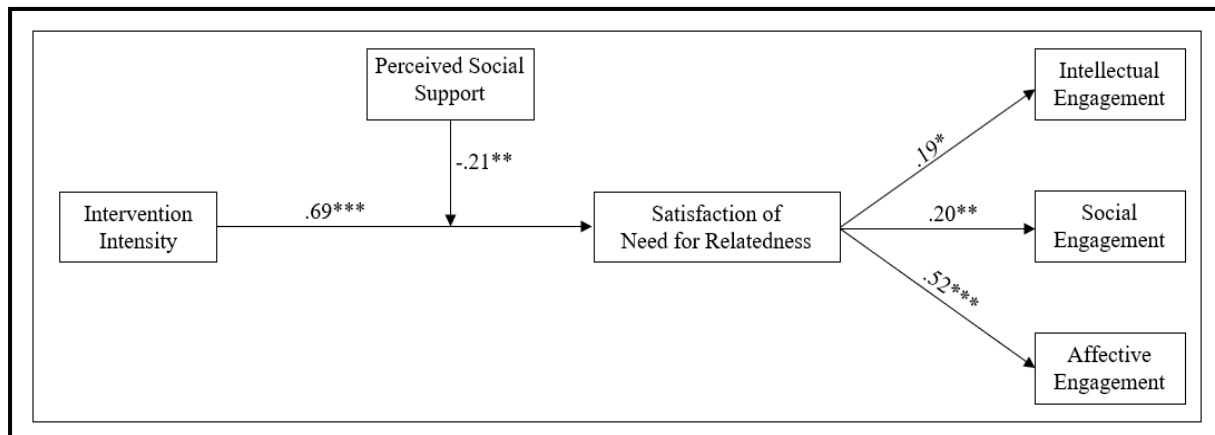
Note. *p < 0.05, **p < 0.01, ***p < 0.001
Figure 2. Structural Equation Model

4.1 Direct Effects

All our direct effect hypotheses, i.e., H1 (a, b, and c) and H2 were supported as the predicted relationships were found to be statistically significant. Figure 2 details the effect size of each of our hypotheses. The standardized coefficient of the effect size of intervention intensity on the satisfaction of need for relatedness is 0.69 ($p < 0.001$). The satisfaction of need for relatedness affects the intellectual, social, and affective engagements at 0.19 ($p < .05$), 0.20 ($p < .01$), and 0.52 ($p < .001$) levels of magnitudes, respectively. The impact of the effect of control variables were found to be statistically non-significant.

4.2 Interaction Effects

The coefficient of the interaction effect of intervention intensity and perceived social support on the satisfaction of need for relatedness is -0.20 ($p < .01$). The result supports the hypothesis H4.
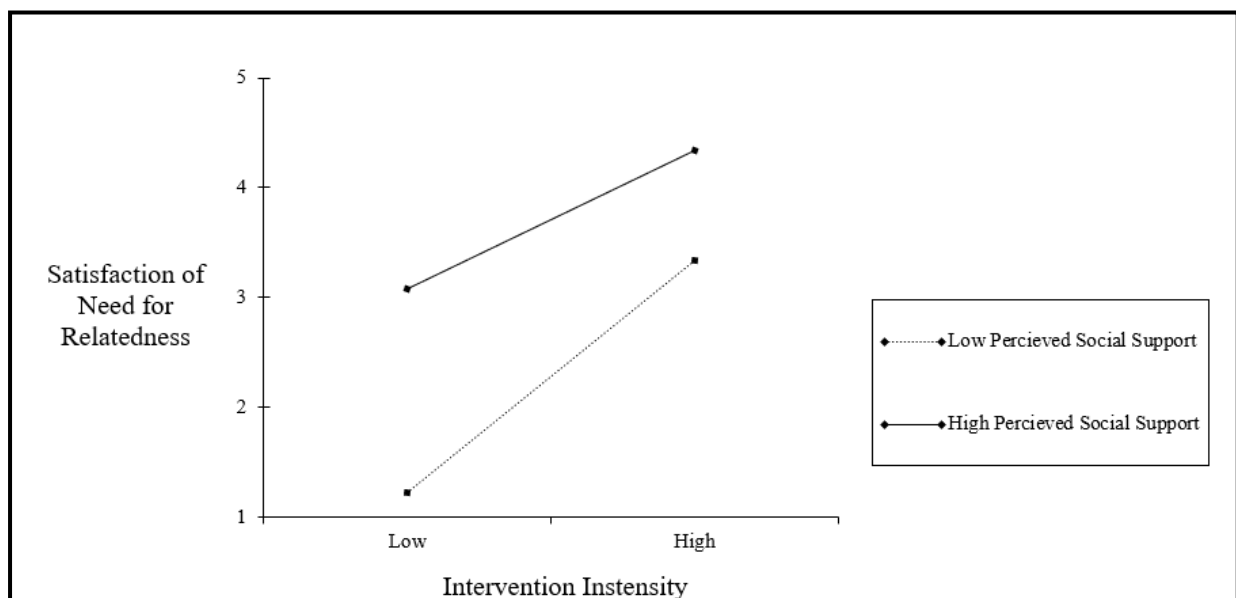

Figure 3. Interaction Effect: Intervention Intensity and Perceived Social Support on the Satisfaction of Need for Relatedness

The interaction effect between intervention intensity and perceived social support was measured through the interaction variable, which was created by standardizing all variables in the model and then computing a product variable from the interacting variables. This product variable was then used as an independent variable in AMOS to check if it has a statistically significant effect on the dependent variable (i.e. the satisfaction of need for relatedness). Once we obtained a significant result, it was plotted. Figure 3 presents the interaction plot. The interaction plot shows that the slope of the graph is higher in case of low perceived social support than in case of high perceived social support. This indicated that when perceived social support is low, interventions have a stronger impact on the satisfaction of need for relatedness. However, when perceived social support is already high, the impact of interventions on the satisfaction of need for relatedness dissipates.

Path	Effect Size	Confidence Level	LLCI - ULCI	Hypothesis Support
H3a: Intervention Intensity → Satisfaction of Need for Relatedness → Intellectual Engagement	-	-	-	Not Supported
H3b: Intervention Intensity → Satisfaction of Need for Relatedness → Social Engagement	.08	95%	[.016 - .165]	Supported
H3c: Intervention Intensity → Satisfaction of Need for Relatedness → Affective Engagement	.32	99%	[.203 - .452]	Supported

Table 4. Mediation Effects

4.3 Mediation Effects

To test the mediation effects, bootstrapping analysis were performed 5000 times to generate the bias-corrected bootstrap confidence interval (Hair et al., 2019). Mediation is statistically significant when the bootstrap confidence interval does not contain zero (Zhao et al., 2010). Using this criterion, the satisfaction of need for relatedness mediated the relationship between intervention intensity and social engagement (95% CI; .016, .165); and between intervention intensity and affective engagement (99% CI; .203, .452). The mediation by the satisfaction of need for relatedness between intervention intensity and intellectual engagement was not statistically significant. Thus, H3 (b, c) were supported, while H3a was not supported. The results are presented in Table 4. While the model is indicative of moderated mediation, i.e., the mediated relationship will be stronger at lower level of perceived social support, and weaker at higher level of perceived social support, the moderated mediation was found to be statistically non-significant.

To summarize, the results support the theorized relationships: (1) the satisfaction of need for relatedness mediates the relationship between intervention intensity and work engagement (except for intellectual engagement); and the (2) perceived social support negatively moderates the relationship between intervention intensity and the satisfaction of need for relatedness.

5 Discussion

In the wake of the prevailing global pandemic, organizations have been forced to implement WFH. The social distancing had a debilitating impact on the informal interactions of employees, and as a result, the work engagement of the employees has been affected. We argue

that the work engagement of employees is affected in WFH because of the lack of satisfaction of their need for relatedness. Organizations have been swift in applying ICT-driven interventions to sustain the employee interactions, with the larger goal to improve the work engagement of employees. However, the relationship between the ICT-driven interventions and work engagement is a black box. In this study, we shed light on the central role of the satisfaction of need for relatedness in driving the work engagement. The satisfaction of need for relatedness is a basic psychological need of an individual to feel a sense of belongingness with relevant others at work and with the organization at large. We also explored the role of perceived social support in influencing the effectiveness of interventions on the need satisfaction.

The results show that the satisfaction of need for relatedness mediates the relationship between intervention intensity, and the social and affective dimensions of work engagement. The relationship between the satisfaction of need for relatedness and affective engagement was the strongest, followed by social engagement. It would be expected that the satisfaction of need for relatedness would have the strongest relationship with social engagement because the satisfaction of need for relatedness is directly connected to social engagement. The satisfaction of need for relatedness deals with the employee's feeling of connectedness to their co-workers, while social engagement is gained through a feeling of connectedness with the work environment.

The results showed that the relationship between the satisfaction of need for relatedness and intellectual engagement is significant, but the mediating effect of the satisfaction of need for relatedness on the relationship between intervention intensity and intellectual engagement is not statistically significant. A plausible reason is that the increase in intellectual engagement is subject to the cognitive resources at the disposal of the individual (Soane et al., 2012). While the increased satisfaction of the need for relatedness leads to positive affect which may enable usage of cognitive resources (Baumeister & Leary, 1995), work engagement intervention does not impact intellectual engagement through the satisfaction of need for relatedness. As the work engagement interventions are directed at increasing the social interactions, they are unlikely to influence the usage of cognitive resources and impact the intellectual engagement. Hence, the mediating effect of the satisfaction of need for relatedness has been found to be statistically insignificant in case of intellectual engagement.

5.1 Theoretical Contributions

The key contribution of our study is the examination of the psychological mechanism underlying ICT-driven interventions and work engagement. These interventions are resource-intensive, and organizations would seek to improve the return on this investment. Our study provides this crucial insight into what factors influence the effectiveness of interventions. With this new knowledge, ICT-driven interventions can be directed towards the satisfaction of need for relatedness to improve their effectiveness in promoting work engagement. On the other hand, if the interventions do not address the satisfaction of need for relatedness, the eventual intended effect on work engagement may be weakened. When interventions are designed keeping the satisfaction of need for relatedness factor in mind, they are likely to lead to employee interactions that are authentic and autonomous, which will have a positive impact on the perceived relatedness of the employees and their work engagement.

Job demand and resources (JD-R) model has been typically used to understand antecedents to work engagement (Bakker & Demerouti, 2007, 2017; Halbesleben, 2010). It is quite broad in

capturing the entire set of antecedents. However, in the context of COVID-19 pandemic, there is one specific aspect that has been of primary concern – the loss of social support. It is the reduction in this job resource, i.e., social support, which has an adverse impact on work engagement of employees in WFH. Keeping the satisfaction of need for relatedness at the centre of the model will help the practitioners to target their interventions more directly at the problem at hand, rather than making the interventions broader and targeting several job resources at a time.

Our application of SDT places the spotlight specifically on the satisfaction of need for relatedness which has been thwarted due to reduction social support. There has been a loss of social support during COVID-19 and drop in work engagement (Kniffin et al., 2021). The loss of social support is due to deterioration in the employee interaction (Wang et al. 2020; Wang et al. 2021). Organizations are implementing ICT driven intervention to bolster the work engagement by improvement in employee interactions (Mosquera et al., 2022; Singh & Verma, 2021). In our paper, we have theorized that the satisfaction of need for relatedness mediates the relationship between intervention intensity and work engagement. One of the key sources of social support in the work context is the team. Work teams develop a work environment over time which provides social support to its members. Our construct perceived social support refers to the employee perception of social support already existing in a team. We argue that if the level of perceived social support in team is high, the satisfaction of need for relatedness is already fulfilled to an extent, and, hence, the positive impact of intervention intensity on the satisfaction of need for relatedness is low. On the other hand, if perceived social support in the team is low, the impact of intervention intensity on the satisfaction of need for relatedness is stronger. Hence, we have theorized perceived social support moderates the relationship between intervention intensity and the satisfaction of need for relatedness.

Need for relatedness is the most recent addition to the basic psychological needs category in SDT (Van den Broeck et al., 2016). Hence, it has received relatively less research attention in the work domain in comparison to the needs for autonomy and competence (Gagné et al., 2018). However, the current COVID-19 pandemic has brought the need for relatedness onto the centre stage.

We find evidence that perceived social support negatively moderates the relationship between intervention intensity and the satisfaction of need for relatedness. If the employee is provided requisite social support in the work environment, the need for relatedness would be satisfied adequately. Work engagement interventions are not needed in this scenario, as the need for relatedness is fulfilled. This results in the reduced effect of ICT-driven interventions on the satisfaction of need for relatedness of the employees. Figure 3 demonstrates the described phenomenon. At higher perceived social support, the relationship between the intervention intensity and the satisfaction of need for relatedness is weaker than a scenario of lower perceived social support.

5.2 Practical Implications

The understanding of ICT-driven interventions is important for practitioners in human-computer interaction (HCI). In the pre-COVID era, most workplace interactions were face-to-face. However, in WFH, the non-verbal cues and contextual information of the interacting participants that were obvious in the offline interactions are now missing in the ICT-mediated interactions. The understanding of virtual interactions needs to evolve to make up for this absence.

The changes in work policy due to recent COVID-19 pandemic have increased the relevance of ICT in enabling organizational initiatives of work engagement interventions. ICT should drive the work engagement interventions in a manner that will not only increase the quantum of workplace interactions, but also needs to be more precise in leading to authentic and autonomous interactions. Otherwise, the efforts will lead towards frustration, rather than satisfaction of the need for relatedness, which will negatively impact the engagement of the employee.

An in-depth understanding of the working of the satisfaction of need for relatedness will help in design and implementation of ICT-driven work engagement interventions. The satisfaction of need for relatedness is contingent on two criteria (Baumeister & Leary, 1995). First, there needs to be frequent interactions with the relevant people. However, the interactions should also be affectively positive, but more importantly, should be largely free of negative affect and conflict. Second, individuals should perceive that the relationships are stable and enduring in the foreseeable future, and that there is authentic affective concern in the interpersonal relations. While the current interventions do attempt to increase the interaction intensity, their scope do not cover for positive affect in interactions and perception of stable relationship. If only one of the criteria is met, the satisfaction is likely to be partial, and hence, the positive impact on work engagement will be limited. It should also be noted the satisfaction of need for relatedness is subject to diminishing returns. This means that while individuals require a certain amount of social relatedness, but once that minimum is satisfied, the priority of forming additional bonds decreases. This indicates there is a limit to which increased interactions can improve the satisfaction of need for relatedness and the work engagement of employees.

ICT-mediated communications in the workplace should be implemented with the aim of making teams function in a more collaborative manner. With the collaborative nature of communications, the perceived social support for the employees is likely to be higher. This will enable the satisfaction of the relatedness need in WFH teams.

The implication of the moderating role of perceived social support is that when it is high, the work engagement interventions may not be very effective in promoting work engagement. Hence, organizations need to be more vigilant in implementing work engagement interventions rather than overall roll-out. The work environment of the target employees should be understood before going ahead with the intervention. It is likely that in teams with high perceived social support, such interventions may look redundant or burdensome at worse.

5.3   Limitations and Future Research Directions

Although the current study explores the role of organizational interventions and social support in the satisfaction of need for relatedness in detail, these are certain limitations to our study. The context of pandemic in which the current research is done is unique in nature. Further research is needed to explore the role of the satisfaction of need for relatedness in the effectiveness of ICT-driven interventions. The implication of prolonged work from home exposure can be explored by conducting similar studies periodically.

We included multiple organizations in the study. Although our study provides a general overview of the response towards ICT-driven interventions from employees who are working from home, further research focusing on fewer organizations will provide a context where

interventions could be more uniform across the employees. On similar line, while our study focused on organizations from the knowledge industry, sector-specific studies can provide insights on the peculiarities in different areas. Also, future studies can be conducted with a higher sample size to confirm the results of the current study. Another limitation of the current study is that the convergent validity of certain constructs is borderline. To improve convergent validity, additional data should be collected, and the scale items of the constructs should be tested and improved to ensure a clear non-ambiguous understanding of the scale items by the future studies.

Further, the educational background and gender representation in the study were uneven. Gender representation is a reflection of the demography in the industry (Kumar & Parveen, 2021). It needs to be seen what happens when the genders have an equitable representation. Lastly, there was a mix of employees in terms of prior WFH experience. Although this effect of prior WFH experience was controlled in our analysis, studies purely focusing on employees with no WFH experience can bring to light new aspects to the understanding of the ICT-driven interventions for work engagement.

6 Conclusion

WFH is an important work design in the future of work (Gagne et al., 2022). It is becoming more prevalent with the development and advancement in communication technologies (ICT). Further, the recent COVID-19 pandemic forced organizations to implement work-from-home on an organizational scale. The transfer of work from office to home has given rise to new challenges, especially to work engagement. Also, COVID-19 pandemic presents a novel context wherein employees have been enforced with WFH. Consequently, work engagement has become one of the top priorities for the organizations as it is a crucial success factor.

Organizations have used ICT-driven initiatives to manage the work engagement among WFH employees. Given the importance of engagement to organizations and the resource intensiveness of ICT-driven initiatives in terms of time, money and effort, the effectiveness of these interventions becomes crucial. This study shows that the satisfaction of need for relatedness of employees mediates the relationship between interventions and work engagement. In the world of practice, engagement is typically considered as a catch-all umbrella term for positive work-related attitudes (like organizational commitment, job satisfaction, organizational citizenship, and intention to stay) (Robertson, 2012), and, with this understanding, the interventions often get directed at supporting various job resources. The effectiveness of the interventions can be improved if the focus can be directed on enabling the satisfaction of need for relatedness. Further, the study also shows that perceived social support in a team negatively moderates the relationship between intervention intensity and the satisfaction of need for relatedness. This indicates that an organization-wide roll-out of ICT-driven intervention would be a crude attempt at addressing engagement, because it does not take into consideration the existing social support in a team. We suggest that ICT-driven interventions should be implemented with awareness and understanding of the team environment.

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