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How supervisors can support employees' needs and motivation? an experimental study based on SDT

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Abstract
Supervisors and managers have an increasingly significant role in employees' motivation. The applied framework in this field research was the Self-Determination Theory (SDT). In this way, it was assessed that whether supervisors can be trained in order to support employees' basic psychological needs including autonomy, relatedness, and competence. As a result, their need satisfaction and autonomous motivation were promoted, at the same time, the controlled motivation and amotivation were reduced. The training was provided to 15 supervisors then employees' need satisfaction, amotivation, controlled motivation, and autonomous motivation were investigated, pre- and post-intrvention. Performing a multilevel regression analysis revealed that employees in the intervention group showed an increment in autonomous motivation and need satisfaction, as well as a significant reduction in amotivation than those of the control group. Furthermore, increasing autonomous motivation and decreasing amotivation were moderated via increasing need satisfaction. An added value has been provided for the mentioned theory on need satisfaction by the current study. It was also indicated that a relatively brief intervention for supervisors may affect creating employees need support, and autonomous motivation increment, and amotivation reduction.

Keywords Need support · Amotivation · Controlled motivation · Autonomous motivation · Supervisors · Self-determination Theory

Introduction

Many people around the world work in organizations whose jobs and working conditions are different. Some of these jobs are relatively interesting and valuable; the work environment of these jobs is supportive and people working in this environment feel fair and equal in terms of their pay. Others, on the other hand, may be working in jobs where job demands are high, their working conditions are unsatisfactory, and people perceive their pay as unfair. In such jobs, people are more likely to wait for the day when they retire sooner (Deci et al., 2017); both of these types of jobs may exist in profitable organizations.

Profitability is the minimum expectation for an organization. Organizations are looking for high levels of effectiveness and productivity; Effective and productive organizations not only care about the profitability of their stakeholders but also seek to benefit all of them; including their employees, investors, and consumers. Effective organizations both seek to increase the quality of their performance—or, in other words, their profitability—and seek to thrive employees through job motivation and well-being (Ryan & Deci, 2018). In fact, instead of pursuing short-term goals, effective organizations seek organizational health, customer satisfaction, and long-term financial success with the help of employees with high levels of motivation and well-being (e.g., Doshi & McGregor, 2015; Mackey & Sisodia, 2014; Pink, 2009).

Having a high-performance workforce is important to maintaining the competitive atmosphere of organizations. Employee motivation is essential for such organizational success. According to Self-Determination Theory (SDT; Deci & Ryan, 2000; Gagne & Deci, 2005) employees feel and perform better when their motivation is autonomous

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in nature, that is, when they volitionally engage in their work because they find it enjoyable, interesting or valuable. Employees function less optimally when they are motivated in a controlled way and engage in particular behavior out of inner or external pressures. Based on SDT, employees have autonomous motivation when their needs for autonomy, competence, and relatedness are satisfied, while controlled motivation occurs when these needs are unsatisfied. The present study aims to test this assumption through an intervention study. Specifically, we indicate a field experiment investigating the effect of a need support intervention on employees' need satisfaction, autonomous and controlled motivation, and amotivation. In the intervention, supervisors are trained to support employees' basic psychological needs. We expect the intervention group compared to the control group employees, to show higher levels of need satisfaction and autonomous motivation and lower levels of controlled motivation and amotivation.

Motivation in the theory of self-determination

According to Pinder (2008), work motivation is a set of energetic forces, aroused within and beyond a person's essence, to start work-related behavior and determine its manner, intensity, direction, and duration. There are several theories on work motivation, each of which differently explains this variable. One recent theory approved by many researchers is SDT (Ryan & Deci, 2000), a theory focusing on different types (instead of the amount) of motivation in individuals.

As a macro theory SDT is related to human motivation. It has successfully been used in several areas including, education, parenting, psychotherapy, health, exercise and physical activity, work, and management (Ryan and Deci, 2017). This theory specially emphasizes that the motivation types employees display in work activities affect their performance and level of well-being. In addition, SDT distinguishes different types of motivation and considers different functions and consequences for each type of motivation (Deci et al., 2017). In this theory, special attention has been paid to the two concepts of controlled and autonomous motivation.

Types of motivation in SDT

The autonomous motivation concept refers to participation in behaviors which are innate and related to individuals' inner goals; in other words, these behaviors are self-determined (Hagger and colleagues, 2014). The autonomous motivation concept is the participation and involvement of individuals in behaviors which are accompanied by desire, will, and choice. In most cases, autonomously regulated behaviors innately motivate an individual (Deci et al., 2017). If the work environment provides the right conditions, activities that are externally motivated will also become autonomous. When employees understand the value and the purpose of their work, feel autonomous regarding what they do, and receive the necessary feedback and support from their environment, they will be autonomously motivated, will perform better, and will adapt to the conditions and work environment better (Deci et al., 2017).

On the contrary, the controlled motivation concept refers to the participation of individuals in behaviors with an external cause; individuals engage in these behaviors to gain reward, approval of others and shun punishment or guilt (Hagger et al., 2014). The controlled motivation concept refers to participating in activities that results from outer pressure or control (Deci et al., 2017). Extrinsic (i.e., controlled) motivation reduces the employees' efforts, leads them to set short-term goals, and has negative effects on their job performance and commitment (Deci et al., 2017; Van den Broeck et al., 2017).

Besides considering various types of motivation, SDT identifies a state of amotivation during which an individual is amotivated to perform an activity. A person with no inner or outer motivation to do activities is called amotivated (Deci & Ryan, 2008). Amotivation is a state of unwillingness to act. When an individual is amotivated, he lacks the intention and the sense of personal causation. Amotivation is a strong and negative predictor of commitment, learning, and well-being (Cheon & Reeve, 2015; Cheon et al., 2016; Ryan & Deci, 2020). Amotivation seems to come from two general sources. The first type is because of considering insignificance and not valuating the activity. In this case, the amotivated person feels that he is not gaining the benefit of his efforts and as a result, he perceives his actions as insignificant and worthless (Ryan et al., 2011). Amotivation of the second type can be due to the perceived incompetence (Deci & Ryan, 1985) or the beliefs about positive self-efficacy (Bandura, 1996).

Researches have indicated that autonomous motivation brings significant individual and organizational results. For instance, the autonomous motivation is associated with effort in high levels (Stynen, Van den Broeck, Cooman et al., 2013, De Cooman et al., 2013), hardiness and persistence (Deci & Ryan, 2008), in-role performance (Moran, Diefendorff, Kim, & Liu, 2012), job engagement (Slemp et al., 2018), creativity (Kark et al., 2018), and lower turnover intentions (Williams et al., 2014). In addition, autonomous motivation is related to well-being dimensions (for example, job satisfaction in high levels (Gillet et al., 2013), effective adjustment (Deci & Ryan, 2008), and less emotional burnout (Van den Broeck, Lens, De Witte, & Van Coillie, 2013). On the contrary, a good deal of research have revealed that controlled motivation has a negative effect on variables of performance

and well-being (Gagné et al., 2015). Moreover, it has been shown that amotivation is correlated with a broad span of negative job outcomes such as vitality in low levels, job effort, emotional commitment, adjustment, dynamism, and job satisfaction and too high levels of burnout, emotional fatigue, and turnover intention (Howard et al., 2016; Gagné et al., 2015; Tremblay et al. 2009).

From this overview it becomes evident that autonomous motivation is a significant advantage for employees and organizations alike, while controlled motivation and especially amotivation should be avoided. Hence, it becomes crucial to understand how autonomous motivation can be fostered, and controlled motivation and amotivation can be decreased. In SDT, satisfaction of three basic needs is considered a prerequisite for autonomous motivation, while it also has the potential to offset controlled motivation (Gagne & Deci, 2005; Ryan & Deci, 2000).

Basic psychological needs satisfaction

The base of SDT is on the basic psychological needs, considered as the necessary energy to help to actively engage with the environment, develop skills and grow healthily (Deci & Ryan, 2011). These needs are innate in all human beings and are essential for self-regulation and well-being, just like food, water, and shelter that are essential for human physical health (Deci & Ryan, 2000). These include the needs for relatedness, autonomy, and competence.

The need for autonomy includes having the sensation of choice in starting, maintaining, and regulating activities. Autonomy befalls when people feel that themselves are the reason for their behaviors (Deci & Ryan, 2000). The need for competence is the need for effectiveness in interacting with society and surroundings. This concept indicates a tendency to use talents and skills in performing tasks, to pursue optimal challenges, and to master those (Deci et al., 2017). Employees can adjust to ever-changing and complicated situations and fulfill the need for competence if they have an opportunity to involve in challenging tasks and develop their skills (Jungert, Van den Broeck, Schreurs, & Osterman, 2018). Ultimately, the need for relatedness is a concept referring to the establishment of bonds and emotional involvements with other people and expresses a desire to be involved in intimate relationships (Ryan & Deci, 2000). The need for relatedness is an important motivational structure because when interpersonal relationships support the need for relatedness, individuals perform their tasks better, become more resilient to stressful situations, and have fewer psychological problems (Reeve, 2018).

Van den Broeck et al. (2016), in a meta-analysis of 99 studies, examined the consequences of basic need satisfaction. The results of the meta-analysis showed that the basic psychological need satisfaction is associated with increased positive emotion, job engagement, overall well-being, life satisfaction, job satisfaction, emotional commitment, and reduction of negative emotion, burnout, and intention to leave (Van den Broek et al., 2016). In addition, need satisfaction seems to be associated with autonomous motivation and in turn, may neutralize controlled motivation and prevent amotivation (Jungert et al., 2018; Van den Broek et al., 2016).

Extensive research has also been done on the antecedents of need satisfaction (Van den Broek et al., 2016). According to the meta-analysis conducted by Van den Broek et al. (2016), individual and personality variables (such as self-esteem, self-efficacy, optimism, causal orientation, etc.), job stressors (such as job demands, role stressors, organizational policies, etc.), job resources (such as diversity of skills, job identity, job meaning, job independence, social support, and feedback) and organizational variables (such as positive leadership behaviors, perception of equality, person-environment fit, etc.) are among the most important antecedents of basic psychological need satisfaction.

Based on SDT, the existence of a social context in an organization may cause the satisfaction or the frustration of employees' basic psychological needs by providing or prohibiting support (Deci et al., 2017). Employees seek support in their work environment because the support they receive from their social environment would help them to adapt to their environment, withstand problems, perform better, and maintain their motivation to work in that environment (Ryan & Deci, 2017). Employees can be supported in their work environment by the organization, top-level managers, immediate supervisors, or their co-workers. Immediate supervisors who directly supervise their subordinates know their needs better than top-level managers do. Thus, they are able to provide the conditions to support their needs (Slemp et al., 2018).

Perceived supervisor need support

The perceived supervisor needs support refers to employees' perception of their supervisor's basic psychological needs support. Employees' needs for autonomy, competence, and relatedness are included in supervisors' support (Williams et al., 2011). The support of employees' need for autonomy includes being aware of their views and taking them into account in decision-making, supporting their decisions and ideas, providing explanatory rationales when requesting employees, and minimizing pressures and requirements when performing tasks (Williams et al., 2014). In addition, supervisors can support competence by relying on the employees' capability to succeed, eliminating barriers of success, providing non-judgmental feedback, and creating

opportunities and challenges for their skills development and problem-solving ability. Finally, supervisors can support relatedness by creating an intimate atmosphere among employees, empathizing with them, and providing a warm and intimate interpersonal relationship even if the employees have not achieved the desired work outcomes (Parfyonova et al., 2019). In summary, supporting autonomy, competence, and relatedness refer to the supervisors' active involvement with their subordinates and employee-centered interactions (Williams et al., 2014).

According to SDT, the reason why supportive social conditions improve the individuals' level of performance and well-being is that such conditions facilitate the internalization process (Ryan & Deci, 2000). Internalization is the action of accepting or absorbing the value of behaviors that are essential, although they may not be intrinsically enjoyable or satisfying (Ryan, 1993). In other words, perceived support in the social context affects the individuals' perception of autonomy, competence, and relatedness. It also can result in satisfying the three mentioned needs through facilitating the internalization process (Williams et al., 2014).

Needs support intervention program

Supporting individuals' basic psychological needs, similar to a teaching style, a coaching method, a parenting style, or a leadership style, require techniques and skills which can be taught (Reeve, 1998; Williams et al., 2014). When individuals' psychological needs are supported and their behaviors are not controlled by others, they have the ability to perform positively and favorably in various areas (Reeve, 2018). *The Needs Support Intervention Program* (NSIP) includes a set of techniques and skills which provide supportive individuals (e.g., teachers, parents, coaches, and supervisors) with the right way to support the basic psychological needs of supported individuals (for example, students, children, athletes, and employees) (Cheon & Reeve, 2015; Ryan & Deci, 2018). These techniques and skills are categorized into three general categories: 1) techniques for supporting autonomy; 2) techniques for supporting competence (structure); and 3) techniques for supporting relatedness (involvement) (Reeve, 2018; Ryan & Deci, 2018; S´nchez-Oliva e al., 2017).

Techniques for supporting autonomy include the five techniques of taking the person's perspective, providing explanatory rationales, using non-pressuring informational language, acknowledging and admitting negative affect, and being patient. Competence support techniques seek to satisfy the need for competence through structuring the social environment by the supportive individual. To create a structured environment, the supportive individual can use the techniques of clear expression of expectations, guidance, feedback, and failure tolerance. Finally, involvement techniques, (i.e., the techniques related to supporting relatedness to create a warm and intimate atmosphere in interpersonal relationships) seek to satisfy the need for relatedness. These techniques which seek to enrich interpersonal relationships include interpersonal interactions (i.e., individualized conversation, enthusiasm, and general friendly communication), social support (i.e., task-related support, the promotion of teamwork and cooperation), and attention (i.e., awareness and caring behaviors) (Reeve, 2018).

The results of research studies on the effectiveness of *the NSIP* indicated that this intervention was more effective for both learners and those under their supervision than the control group. Regarding learners, research showed that this training could change the motivational style of learners from controlled style to supportive style (Cheon et al., 2016; Hardre & Reeve, 2009; S´nchez-Oliva et al., 2017), could satisfy basic psychological needs of learners, and could increase their level of self-efficacy and intrinsic motivation (Cheon et al., 2018). In addition, the results stated that teachers, coaches, and supervisors' use of techniques to support basic psychological needs could satisfy the basic psychological needs of students, athletes, and employees (Cheon et al., 2016; Jungert et al., 2018; S´nchez-Oliva et al., 2017), the increase of autonomous motivation (Hardre & Reeve, 2009; Jungert et al., 2018; Tilga et al., 2019) and well-being levels (Cheon et al., 2012), and the decrease of controlled motivation level (Hardre & Reeve, 2009; Jungert et al., 2018).

Research hypotheses

In the current study, it was attempted to assess the effectiveness of the NSIP in satisfying employees' basic psychological needs and work motivation dimensions (autonomous motivation, controlled motivation, amotivation). Accordingly, the following two general hypotheses were examined.

Hypothesis 1: According to the literature review and SDT, the training of the NSIP could satisfy the employees' needs 1) for autonomy, 2) for competence, and 3) for relatedness.

Hypothesis 2: The training of the *NSIP* would result in the employees' 1) more autonomous motivation, 2) less controlled motivation, and 3) most importantly, less amotivation.

Hypothesis 3: Employees engaging in the experimental intervention will experience autonomous increment in motivation and reduction in controlled motivation and amotivation through increasing basic needs satisfaction, while employees in the control group won't experience such positive changes.

Method

Participants

It was a randomized controlled trial study in which the population included all employees and their immediate supervisors in an industrial company in Khuzestan, Iran. They were totally about 1300 individuals. Among them, 30 supervisors were selected voluntary. The inclusion criteria consisted of having more than five years of work experience and supervising three to five employees. Then, using the random method, 15 supervisors were allocated to the intervention group, and 15 supervisors to the control group. Furthermore, to examine the impact of the intervention, considering the number of subordinates, two or three individuals were randomly selected among the subordinates of each supervisor. Accordingly, the sample size of the intervention group was 43, and that of the control group was 40. Thus, the sample included 30 supervisors and 83 employees (Given that the research was conducted at the time of the coronavirus pandemic, the selection of supervisors was voluntary and aimed at selecting individuals who have the motivation to participate in the research. Also, the prevalence of Covid-19 caused the number of employees participating in the research to be lower than expected. According to these conditions, the minimum sample size to determine the number of employees, Tabachnick and Fidel (2001) formulas were used).

About the supervisors, the mean and the standard deviation of the age in the intervention group were 44 and 5.98, respectively, and in the control group were 49 and 6.42, respectively. Besides, regarding the employees of the intervention group, the mean and the standard deviation of the age were 39.77 and 5.89, respectively, and of the control group were 39.96 and 6.46, respectively. Moreover, supervisors' work experience average in the intervention and control groups were 19.40 and 23.69, respectively, and the average work experience of employees in the intervention group and control group were 15.19 and 17, respectively.

Before the intervention, the scales were administered to the employees in the intervention and control groups virtually. Then, the supervisors in the intervention group received the *NSIP* in eight 90-min sessions during two months. However, these interventions did not provide to the supervisors in the control group. It should be noted that a meeting was held to introduce the control group supervisors to the therapist and to explain the objective of the study. The *NSIP* training sessions were held virtually due to the prevalence of Coronavirus and the imposing limitations. Two weeks after the intervention sessions, the post-test was administered to the employees of both intervention and control groups virtually (Fig. 1).

Measures

Need satisfaction at work Scale (NSa-WS, Stenling & Tafvelin, 2018) is a tool which has been used to assess needs satisfaction in this study. It has consisted of 13 items and three dimensions of autonomy (four items), competence (four items), and relatedness (five items). The responses of the participants are scored on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). The internal consistency coefficients related to the variables

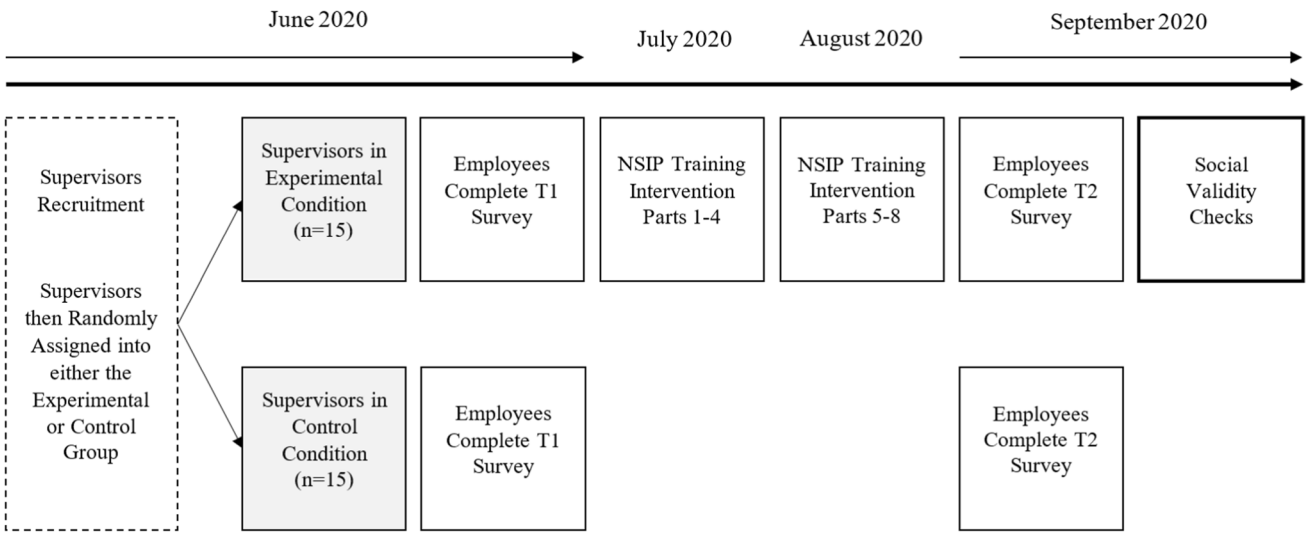

Fig. 1 The Schedule of procedures for the needs-supportive supervisor training program and the data collecting

of autonomy (α = 0.89 at Time 1, and α = 0.86 at Time 2), competence (α = 0.90 at Time 1, and α = 0.82 at Time 2), and relatedness (α = 0.89 at Time 1, and α = 0.90 at Time 2) were satisfactory.

Multidimensional work motivation scale (MWMS, Gagné et al., 2015) was used to assess amotivation, controlled motivation, and autonomous motivation. It has consisted of 19 items and six subscales of amotivation (three items), intrinsic motivation (three items), material external regulation (three items), social external regulation (three items), introjected regulation (four items), and identified regulation (three items). A 7-point Likert scale was used to score responses from 1 (not at all) to 7 (completely). The sum of the items of social introjected regulation, external regulation, and material external regulation items was used to assess the controlled motivation. Also, the total sum of the items of intrinsic motivation and identified regulation was used to assess autonomous motivation. Internal consistency coefficients related to amotivation (α = 0.90 at Time 1, and α = 0.86 at Time 2), controlled motivation (α = 0.74 at Time 1, and α = 0.79 at Time 2), and autonomous motivation (α = 0.95 at Time 1, and α = 0.94 at Time 2) were satisfactory.

The social validity of the intervention

The social validity refers to the acceptability of the intervention procedures, and usually examined through asking the opinions of the participants in the intervention (i.e., the intervention group) (Luiselli & Reed, 2011). Social validity examines the satisfaction level of the participants regarding the training process and its effectiveness through four indicators, including positive significant changes, importance, satisfaction, and efficiency (Cheon & Reeve, 2015).

In order to evaluate each of the four indicators, the following questions were asked from the samples of the intervention group: 1- The indicator of positive significant changes: Has your participation in this training program led to positive changes in your motivational style? (1 = not at all, 7 = absolutely yes); 2- Importance indicator: Was your participation in this training program important and significant? (1 = not important at all, 7 = absolutely important); 3- Satisfaction indicator: How satisfied were you with this training program? (1 = not satisfied at all, 7 = absolutely satisfied); 4- Efficiency indicator: Has this training program been useful to you? (1 = not at all, 7 = absolutely useful).

According to the assessment, the supervisors participating in the training course reported that there were positive changes in their motivational style (M = 6.23, SD = 0.64). In addition, they reported high scores in terms of importance (M = 6.38, SD = 0.74), satisfaction (M = 6.42, SD = 0.72), and efficiency (M = 6.35, SD = 0.52). Therefore, since the estimated means are higher than the median (Me = 4), *NSIP* had an appropriate social validity.

Data analysis approach

The IBM SPSS Statistics for Windows, Version 24.0, and AMOS software, Version 24.0 (IBM Crop., Armonk, NY, USA) were used for all preliminary analyses and the test of hypotheses.

Results

Preliminary analyses

The mean and standard deviation for every variable at each stage of measurement, separately for the intervention and control groups, have been presented in Table 1, and their inter-correlations for the two measurement occasions has been presented in Table 2.

The average scores of need satisfaction dimensions, autonomous motivation, controlled motivation, and amotivation of the intervention group were compared with those of the control group, using the t-test. The results revealed some significant differences, except for controlled motivation (see Table 1).

A set of confirmatory factor analyses (CFAs) in AMOS version 24 was performed to examine the dimensionality and measurement equivalence of the need satisfaction. Only the data related to pre-intervention were analyzed, because of statistical power reasons. The researcher examined the dimensionality related to the subscales of need satisfaction. The present study has used the scale items as the latent factor indicators. The latent factors also were considered permissible to be correlated. Two sets of errors were permitted to vary within factor, but not between factors aimed to allow for covariance due to high content overlaps, potential sub-facets, and similar wording (Cole et al. 2007).

The results stated that the three-factor model for needs satisfaction was suitable and compatible with the data and the one-factor model (Three-factor model: $\chi^2 = 96.62$, df = 58, $p = 0.001$, TLI = 0.94, CFI = 0.95, RMSEA = 0.09; One-factor model: $\chi^2 = 166.93$, df = 61, $p = 0.000$, TLI = 0.84, CFI = 0.87, RMSEA = 0.15; $\Delta\chi^2$ (3) = 70.31, $p < 0.001$). The decision to separate the three needs has been confirmed by the recent result and it has been shown that there was a difference between the needs for relatedness, competence, and autonomy.

Table 1 Pre-intervention and post-intervention differences in basic needs satisfaction and motivation in the experimental and control group

	Experimental			Control						
Variable	M	SD	N	M	SD	N	t	df	p	d[95%CI]
Need satifaction										
T1 autonomy	14.74	3.50	43	14.28	4.32	40	0.55	81	0.59	0.47[-1.24; 2.18]
T2 autonomy	17.67	2.36	43	14.55	3.90	40	4.46	81	0.00	3.12[1.73; 4.52]
T1 competence	16.35	2.83	43	16.03	4.23	40	0.41	81	0.68	0.32[-1.24: 1.88]
T2 competence	18.35	2.02	43	16.18	3.72	40	3.34	81	0.00	2.17[0.88; 3.47]
T1 relatedness	18.91	3.76	43	17.23	4.71	40	1080	81	0.08	1.68[-0.17; 3.54]
T2 relatedness	21.28	3.14	43	17.40	4.57	40	4.54	81	0.00	3.88[2.18; 5.58]
Motivation										
T1 autonomous	31.53	8.39	43	31.00	10.91	40	0.25	81	0.80	2.13 [-3.70; 4.77]
T2 autonomous	36.95	6.76	43	31.40	10.40	40	2.90	81	0.01	1.91 [1.75; 9.36]
T1 controlled	37.95	9.86	43	35.85	8.95	40	1.02	81	0.31	2.10 [-2.02; 623]
T2 controlled	37.93	9.80	43	36.10	8.85	40	0.89	81	0.38	1.83 [-2.26; 5.92]
T1 amotivation	5.58	3.90	43	5.83	4.52	40	-0.26	81	0.79	-0.24 [-2.08; 1.60]
T2 amotivation	1.26	2.11	43	6.05	4.42	40	-6.38	81	0.00	-4.79 [-6.29; -3.30]

d is mean difference. TI = Time 1; T2 = Time 2

Test of hypotheses

In the first stage of the multiple regression analysis, experimental condition (0 = control group; 1 = intervention group), the demographic control variables of age and tenure, and the time (0 = before intervention; 1 = after intervention) were entered as predicting factors for need satisfaction dimensions, autonomous motivation, controlled motivation, and amotivation. Furthermore, the interaction between experimental conditions and time was included in the intended model. By doing so, the researcher can examine if individuals in the intervention group would display a greater increment regarding autonomous motivation and need satisfaction dimensions and a greater reduction regarding controlled motivation and amotivation than those of the control group.

At the second stage of the analysis, autonomy, competence, and relatedness were entered as time-varying predictors. They were measured before and after intervention, in the process of analyzing the predictors of amotivation, controlled motivation, and autonomous motivation. In this way, it was possible to relate the changes of need satisfaction dimensions to changes of amotivation, controlled motivation, and autonomous motivation as it has been stated in the research hypotheses. The results have been presented in Table 3.

Regarding the dimensions of satisfaction and motivation the interactions indicating differences between the intervention and the control groups were important, although they were not so regarding the controlled motivation (Table 3, First step). The interactive impact of the time and intervention has been exactly presented in Figs. 2 and 3. These two figures have presented the scores before and after the intervention for need satisfaction dimensions, amotivation, controlled motivation, and autonomous motivation for both intervention and control groups. Significant increases were observed in the intervention group in autonomy ($\beta = 0.32$, SE = 1.14, $p = 0.017$), competence ($\beta = 0.41$, SE = 0.89, $p = 0.004$), and relatedness ($\beta = 0.31$, SE = 1.23, $p = 0.022$) after the intervention. A trend to increase was observed among samples of the intervention group in autonomous motivation variable after the intervention ($\beta = 0.28$, SE = 2.69, $p = 0.040$). Conversely, a trend to decrease was observed in amotivation among samples of the intervention group ($\beta = -0.48$, SE = 1.21, $p = 0.0001$).

At the second stage of the regression analysis for predicting amotivation, controlled motivation, and autonomous motivation, the variables of relatedness, competence, and autonomy were included in the intended model. The second stage of Table 3 has indicated that need satisfaction dimensions were positively correlated to autonomous motivation and negatively to amotivation, but not to controlled motivation. Hence, an increment in need satisfaction dimensions between T1 and T2 was linked to an increment in autonomous motivation and a reduction in amotivation, but not in controlled motivation. During the process of adding need satisfaction dimensions to the intended model the interactive impact of time and intervention on autonomous motivation was not significant anymore, $\beta = 0.01$, but was significant for amotivation, $\beta = -0.29$, $p = 001$. The bootstrapping in AMOS (5,000 replications) was applied to assess the rate that need satisfaction dimensions bring the impact of time*intervention to amotivation and autonomous motivation. Table 4 presents the results.

The bootstrapping results showed the positive indirect impact of the intervention on autonomous motivation through autonomy (indirect effect = 0.24, CI = 0.07 to 0.40),

Table 2 Inter-correlations among the study V variables at the two measurement occasions

Variables		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Autonomy 1	-	0.94**	0.74**	0.70**	0.45**	0.43**	0.45**	0.68**	0.67**	0.08	-0.50**	-0.47**	-0.16	-0.13	0.19
2	Autonomy 2	0.99**	-	0.71**	0.68**	0.37**	0.35**	0.66**	-0.66**	-0.06	-0.06	-0.54**	-0.51**	-0.13	-0.10	0.15
3	Competence 1	0.85**	0.85**	-	0.95**	0.44**	0.44**	0.77**	0.78**	0.06	0.05	-0.60**	-0.60**	-11	-10	0.20
4	Competence 2	0.84**	0.84**	0.99**	-	0.39**	0.42**	0.77**	0.79**	0.07**	0.06	-0.53**	-0.53**	-0.02	-0.03	0.13
5	Relatedness 1	0.87**	0.85**	0.75**	0.73**	-	0.95**	0.41**	0.41**	0.17	0.17	-0.49**	-0.47**	0.01	0.04	0.25
6	Relatedness 2	0.87**	0.86**	0.76**	0.74**	0.99**	-	0.44**	0.44**	0.19	0.19	-0.54**	-0.52**	0.03	0.02	0.19
7	Autonomous motivation 1	0.84**	0.81**	0.76**	0.76**	0.77**	0.77**	-	0.98**	0.15	0.15	-69.**	-0.72**	0.09	0.02	0.12
8	Autonomous motivation 2	0.83**	0.80**	0.74**	0.74**	0.75**	0.74**	0.99**	-	0.19	0.18	-0.67**	-0.72**	08	0.01	0.12
9	Controlled motivation 1	0.14	0.14	0.30	0.28	0.14	0.15	0.35*	0.38*	-	0.89**	0.07	0.06	-0.09	-0.02	-0.25
10	Controlled motivation 2	0.10	0.10	0.25	0.23	0.11	0.12	0.32*	0.35*	0.35*	0.99**	-	0.09	0.07	-0.02	-0.25
11	Amotivation 1	-0.72**	-0.72**	-0.76**	-0.74**	-0.67**	-0.67**	-0.66**	-0.63**	-0.17	-0.13	-	0.85**	-0.12	0.02	-0.10
12	Amotivation 2	-0.72**	-0.72**	-0.77**	-0.76**	-0.68**	-0.68**	-0.68**	-0.65**	-0.18	-0.15	-0.98**	-	-0.18	-0.13	-0.09
13	Age	0.24	0.27	0.13	0.10	0.28	0.29	0.16	0.16	0.02	0.01	-0.20	-0.19	-	0.85**	-0.02
14	Tenure	0.21	0.23	0.12	0.11	0.29	0.30	0.11	0.11	0.03	0.03	-0.19	-0.18	0.88**	-	-0.02
15	Gender	-0.01	-0.02	0.11	0.12	0.03	0.02	0.16	0.13	0.15	0.15	-0.10	-0.11	-0.06	-0.05	-

Correlations above the diagonal: Intervention group; correlations below the diagonal: Control group

*$p < 0.05$;**$p < 0.01$

Gender: 0 = Female, 1 = Male; Age and tenure were measured as continuos variables

Table 3 Multilevel models for development over time and effect of intervention

Autonomy		Competence		Relatedness		Autonomous motivation				Controlled motivation				Amotivation			
						Step 1		Step 2		Step 1		Step 2		Step 1		Step 2	
β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE	β	SE
14.24	3.26	17.01	2.53	19.69	3.48	18.86	7.72	-15.67	4.45	49.55	8.09	41.01	8.91	11.46	3.46	26.38	2.59
0.01	0.10	-0.05	0.08	-0.03	0.10	0.26	0.23	0.25	0.12	-0.20	0.24	-0.20	0.27	-0.24	0.10	-0.24	0.07
0.07	0.07	0.05	0.05	0.19	0.07	-0.15	0.16	-0.22	0.08	0.19	0.16	0.16	0.16	0.11	0.07	0.18	0.05
-0.05	0.81	0.13	0.64	-0.11	0.88	0.01	1.91	0.07	1.01	-0.12	2.01	-0.09	20.02	0.02	0.86	-0.05	0.59
0.02	0.82	-0.11	0.65	-0.06	0.90	-0.01	1.94	-0.03	1.01	0.01	2.04	0.01	2.02	0.04	0.87	0.05	0.59
0.32	1.14	0.41	0.89	0.31	1.23	0.28	2.69	0.01	1.42	-0.01	2.82	-0.04	2.85	-0.48	1.21	-0.29	0.83
								0.52	0.18			-0.17	0.37			-0.05	0.11
								0.27	0.19			0.18	0.37			-0.48	0.11
								0.16	0.12			0.16	0.25			-0.22	0.07
0.13		0.08		0.15		0.09		0.76		0.02		0.06		0.24		0.66	

*$p < 0.05$; **$p < 0.01$

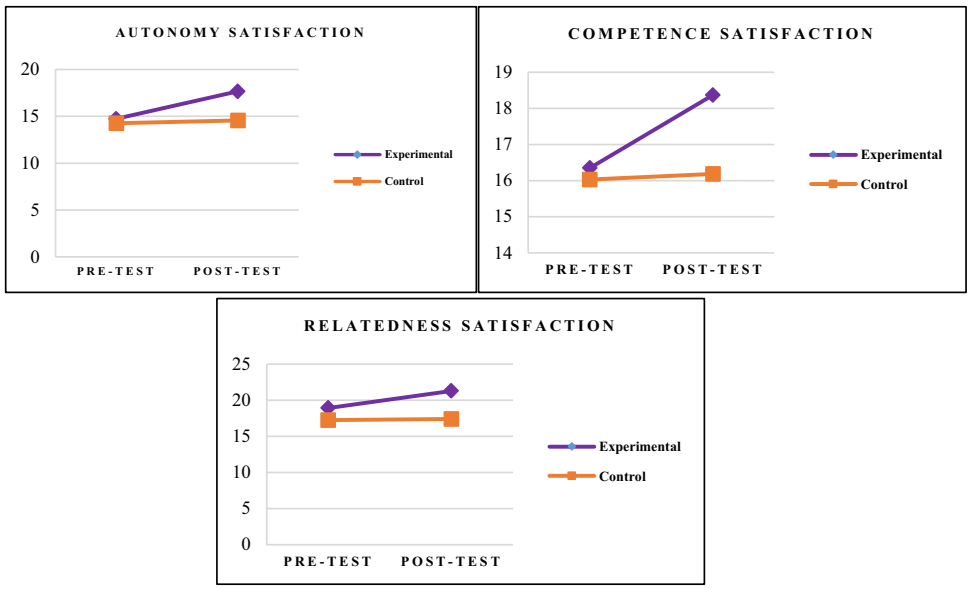

Fig. 2 Employees' autonomy need satisfaction (left panel), competence need satisfaction (right panel), and relatedness need satisfaction (below panel) broken down by experimental condition and time of assessment

competence (indirect effect = 0.18, CI = 0.02 to 0.34), and relatedness (indirect effect = 0.14, CI = 0.01 to 0.28). Also, there were negative indirect effects of the intervention on amotivation through autonomy (indirect effect = -0.18, CI = -0.31 to -0.06), competence (indirect effect = -0.15, CI = -0.29 to -0.01), and relatedness (indirect effect = -0.13, CI = -0.25 to -0.01).

Discussion

Following SDT, the current study tried to assess the effectiveness of *NSIP* in the employees' work motivation (i.e., amotivation, controlled motivation, and autonomous motivation) and need satisfaction (i.e., the need for relatedness, competence, and autonomy). It was demonstrated by the post-intervention results, align with expectations and previous studies, the employees in the intervention group had more autonomous motivation and more satisfaction with psychological needs than the employees in the control group. It is noteworthy that employees of the intervention group reported less amotivation than those of the control group.

Meaningful differences were observed among the employees in the intervention group and employees in the control group regarding satisfaction of basic psychological needs, amotivation, and autonomous motivation. These differences indicated the effectiveness of the experimental intervention and the important and effective role of supervisors in satisfying the employees' needs and motivating them. According to SDT, social context

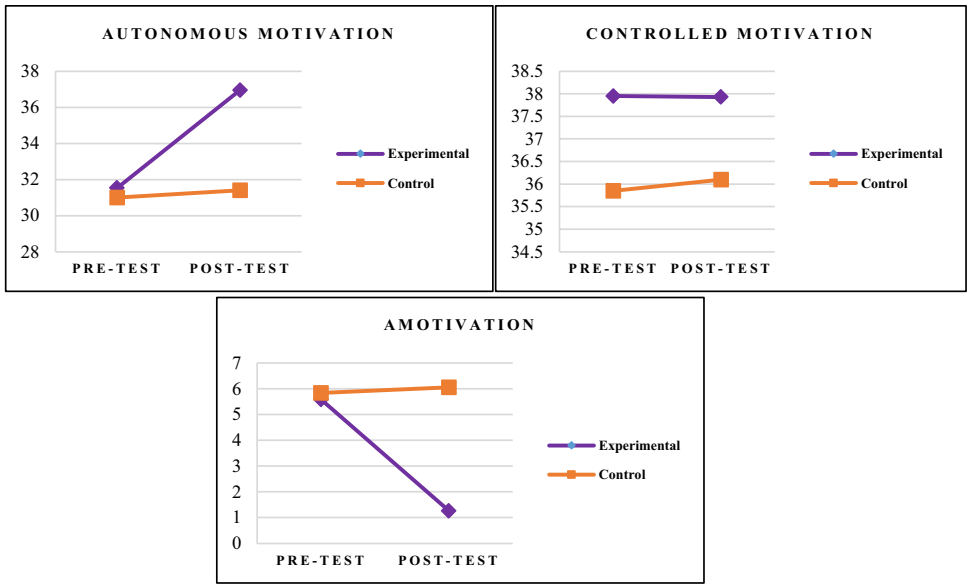

Fig. 3 Employees' autonomous motivation (left panel), controlled motivation (right panel), and amotivation (below panel) broken down by experimental condition and time of assessment

leads to multiple motivational, cognitive, and behavioral consequences through its effect on satisfying or frustration the needs for relatedness, competence, and autonomy (Ryan & Deci, 1985). As one of the most important factors influencing the work environment, supervisors can provide conditions to support the basic psychological needs of employees since they are more familiar with their subordinates. In case of perceived supervisor need support, the subordinates would experience needs satisfaction. Moreover, an increment in need satisfaction between T1 and T2 was linked to an increment in autonomous motivation and a reduction in amotivation. So that need satisfaction moderated the intervention effect on employees' autonomous motivation and amotivation. These results supported SDT, suggesting that satisfying the primary needs for relatedness, competence, and autonomy make it possible for employees to sense the value in the job, get acquainted with the logic to perform the tasks, and/or enjoy working (Ryan & Deci, 2000).

However, one important result obtained in the present study was the ineffectiveness of *NSIP* in the controlled motivation of the intervention group. Based on SDT, if individuals' needs of relatedness, competence, and autonomy are satisfied, their controlled motivation will decrease. However, several studies, including this study, have failed to support this hypothesis (Jungert et al., 2018; Vansteenkiste et al. 2010). The inadequate support regarding the issue that less satisfying need can cause more controlled motivation. This point raises this hypothesis that need frustration is more important than need support in explaining the controlled motivation (Jungert et al., 2018). Some studies have stated that need frustration is an active thwarting of the sense of relatedness, competence, and autonomy. It is also said that need frustration and need satisfaction are independent and differ from one another, as positive and negative affect differ and are independent from one another (Unanue et al. 2014). If employees have few opportunities to choose, are unable to use their competencies in the workplace, or have little relatedness, the less need satisfaction would occur. However, employees feel frustrated if they are forced to do tasks against their values (i.e., frustrating the need for autonomy), defeat in influencing the world around them (i.e., frustrating the need for competence), or sense rejected in the workplace (i.e., frustrating the need for relatedness). In this study the intervention has focused only on increasing the employees' need satisfaction; it did not examine the way to reduce need frustration. This fact may explain the ineffectiveness in controlled motivation.

Table 4 Indirect effect of interaction time*intervention on autonomous motivation and amotivation through need satisfaction dimensions

Mediator variable	Dependent variable			
	Autonomous motivation		Amotivation	
	Indirect effect	95% CI	Indirect effect	95% CI
Autonomy	0.24	0.07; 0.40	-0.18	-0.31; -0.06
Competence	0.18	0.02; 0.34	-0.15	-0.29; -0.01
Relatedness	0.14	0.01; 0.28	-0.13	-0.25; -0.01

Interaction of time and intervention (time*intervention) was independent variable

Age, tenure, time, and group were controlled (covariate variables)

Limitations and some suggestions for future research

Despite numerous significant aspects of the present study, including, pre-test, post-test, and the use of intervention and control groups, there were some limitations. First, methodologically, it was not possible to randomly select the supervisors. The supervisors were selected voluntarily. However, they were assigned to the intervention and the control groups randomly. The supervisors were selected voluntarily to make them interested to participate in the intervention. Nevertheless, to promote the results in terms of validity and generalizability, supervisors were randomly assigned to the intervention and the control groups. Moreover, the employees were randomly selected.

Second, due to the prevalence of Covid-19, the training was done virtually. Since virtual training reduces the amount of interpersonal communication between the trainer and the learner, the effectiveness of the intervention and the content transfer may have been affected. However, in this study, an attempt was made to use the maximum facilities to hold the virtual intervention properly. In addition, before the beginning of the intervention, a session on virtual learning was held for the intervention group's supervisors to increase their awareness and skills.

Third, the only investigated outcome was the employees' motivation. Future research can examine whether this intervention can affect positive outcomes including, job performance, job satisfaction, job engagement, and employees' psychological health. It is also suggested that this intervention be implemented at other levels of the organization, including colleagues, teams, and other levels of management. The effectiveness of the intervention in these groups can be examined.

Implications of the study

In spite of existing all limitations, the results of the current study can provide practical implications for organizations. *NSIP* can teach the supervisors how to support employees' need for relatedness, competence, and autonomy, and also to increase their autonomous motivation levels and reduce their amotivation. Thus, organizations are suggested to implement *NSIP* for their supervisors to provide the employees with positive consequences.

Conclusion

The present study showed the role and the importance of supervisors' basic psychological need support in satisfying employees' need and motivating them. Based on the SDT, there are three basic psychological needs for every human being including, the needs for autonomy, competence, and relatedness. Furthermore, social conditions in any context can influence satisfying these needs through their supportive role. The satisfaction of these needs also leads to the positive effect on individuals' motivation, health, well-being, and performance. Supporting basic psychological needs as a behavioral method and in the form of a set of motivational-behavioral strategies can be taught and learned in various contexts including, family, school, university, or work environment.

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Data availability Data files are available in these links:
https://s19.picofile.com/file/8440365468/Final_Covariance_6.sav.html
https://s18.picofile.com/file/8440365492/combined.sav.html

Declarations

Informed consent Prior to the study, the participants of the experimental and control groups (supervisors and staff) were informed and the purpose of this study was presented to them.

Conflicts of interest The authors declare there is no conflict of interest in this manuscript.

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