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How basic psychological needs and motivation affect vitality and lifelong learning adaptability of pharmacists: a structural equation model

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Abstract Insufficient professional development may lead to poor performance of healthcare professionals. Therefore, continuing education (CE) and continuing professional development (CPD) are needed to secure safe and good quality healthcare. The aim of the study was to investigate the hypothesized associations and their directions between pharmacists' basic psychological needs in CE, their academic motivation, well-being, learning outcomes. Self-determination theory was used as a theoretical framework for this study. Data were collected through four questionnaires measuring: academic motivation, basic psychological needs (BPN), vitality and lifelong learning adaptability of pharmacists in the CE/CPD learning context. Structural equation modelling was used to analyze the data. Demographic factors like gender and working environment influenced the observed scores for frustration of BPN and factors like training status and working experience influenced the observed scores for academic motivation. A good model fit could be found only for a part of the hypothesized pathway. Frustration of BPN is positively directly related to the less desirable type of academic motivation, controlled motivation (0.88) and negatively directly related to vitality (− 1.61) and negatively indirectly related to learning outcomes in CE. Fulfillment or frustration of BPN are important predictors for well-being and learning outcomes. Further research should be conducted to discover how we can prevent these needs from being frustrated in order to design a motivating, vitalizing and sustainable CE/CPD system for pharmacists and other healthcare professionals. Basic psychological needs are very important predictors for well-being and learning outcomes. Further research should be conducted to discover how we can prevent these needs from

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being frustrated in order to design a motivating, vitalizing and sustainable CE/CPD system for pharmacists and other healthcare professionals.

Keywords Continuing education · Continuing professional development · Education in healthcare professionals · Motivation · Pharmacists · Self-determination theory · Well-being · Learning outcomes

Abbreviations

AM	Autonomous motivation, internalized and intrinsic motivation
AMS	Academic Motivation Scale, validated questionnaire used in this study
BPN	Basic psychological needs, needs essential for humans to thrive according to SDT
BPNfrus	Frustration of basic psychological needs
BPNsat	Satisfaction of basic psychological needs
BPNT	Basic psychological needs theory, a mini theory within SDT
CE	Continuing education
CFI	Comparative Fit Index, model fit criteria used in SEM
CM	Controlled motivation, non-internalized and semi-internalized motivation
CPD	Continuing professional development
LLA	Lifelong learning and adaptability, validated questionnaire used in this study
RAM	Relative autonomous motivation, the ratio of AM versus CM in an individual
RMSEA	Root mean square error of approximation, model fit criteria used in SEM
SEM	Structural equation modelling, statistical technique to measure interrelationships between latent variables
SDT	Self-determination theory, motivational theory used as a framework
SRMR	Standardized root mean square residual, model fit criteria used in SEM
TLI	Tucker–Lewis Index, model fit criteria used in SEM

Introduction

Continuing education (CE) and continuing professional development (CPD) in healthcare workers have been identified as essential to secure safe and good quality healthcare (Towle 1998; Rouse 2004; Forsetlund et al. 2009). Furthermore, rapidly changing trends in patient care require them to maintain and update their knowledge, skills and competencies and intend to change their behavior for staying fit-for-practice (Williams 2006; Tran et al. 2014; Janke and Tofade 2015; Meštrović and Rouse 2015).

Studies have reported a ‘lack of motivation’ as one of the main barriers for healthcare professionals to participate in CE/CPD or change their behavior (Lugtenberg et al. 2009; Donyai et al. 2011). Moreover, healthcare professionals are losing their motivation, because of increasing bureaucratic demands and regulations from governments and insurance companies (Gandi et al. 2011; Newell and MacNeil 2011; Schaufeli 2014). Nevertheless, research on motivation in relation to professional development and the performance of healthcare professionals is limited.

Motivation has frequently been studied in various life domains and especially in education (Maslow et al. 1970; Bandura and Cervone 1986; Ryan and Deci 2000a; Pintrich 2000). Most of these studies in the education domain were conducted in structured settings

such as high schools and universities and emphasize the relation between motivation and learning outcomes like study strategies, study performance and students' well-being (Vansteenkiste et al. 2004; Guay et al. 2008; Kusrkar et al. 2012).

In contrast, motivation and learning outcomes in work-based learning environments that are less well-structured have scarcely been studied.

Because motivation plays a pivotal role in job satisfaction, energy and the professional performance of healthcare professionals. We were interested in studying the motivation of healthcare professionals in CE and CPD and its effect on their well-being and learning outcomes. There are several contemporary theories like *expectancy-value*, *attribution*, and *goal orientation* relevant to studying the motivation to learn (Cook and Artino 2016). We have chosen to use the Self-Determination Theory as a framework for our study (Ryan and Deci 2017). This motivation theory gives us practical guidelines for designing education for healthcare professionals because of the emphasis on three basic psychological needs; autonomy (choice), feeling competent and feeling related with others. This theory has been broadly validated in different life domains and across different cultures and countries; therefore, we think the results of our study in Dutch pharmacists could be applied globally to designing other healthcare professionals' education.

Self determination theory (SDT)

SDT (Ryan and Deci 2017) has a multidimensional view on motivation that assesses both the level and quality of motivation. There are three major categories of motivation. The first category, *intrinsic motivation*, refers to engaging in an activity out of pure interest. The second category, *extrinsic motivation*, refers to executing an activity for external reasons such as avoiding criticism, receiving (financial) rewards or ego-enhancement. The third category, *amotivation*, refers to the absence of motivation for an activity. Extrinsic motivation is further divided into 3 subtypes depending on the state of internalization. Internalization refers to the integration of values, initially regulated by external factors, that later become internally regulated. The first (non-internalized) form of extrinsic motivation is *external regulation* which refers to doing an activity to obtain rewards or avoid punishments. The next form is *introjected regulation* (semi-internalized), which refers to acting out of internal pressures like shame or guilt. Lastly, *identified regulation* (most internalized) refers to acting because a person identifies with the value of the activity and accepts it as her own.

External and introjected regulations are frequently merged to depict controlled motivation (CM) and identified regulation and intrinsic motivation are merged to depict autonomous motivation (AM) (Vansteenkiste et al. 2004; Kusrkar et al. 2012). AM has been found to be associated with well-being and learning outcomes like deep learning and academic success (Deci and Ryan 2008; Kusrkar et al. 2012). CM has been found to be associated with outcomes like burnout, procrastination and surface learning (Deci and Ryan 2008; Guay et al. 2008; Abassi and Dargahi 2014). Relative Autonomous Motivation (RAM) is used to express AM relative to CM in an individual (Soenens and Vansteenkiste 2005; Kusrkar et al. 2013). A higher score on RAM means a relatively high AM score compared to the CM score and vice versa.

SDT also proposes that specifiable nutrients are needed to facilitate development, growth and well-being of individuals. These are also referred to as the three Basic Psychological Needs (BPN) (Ryan and Deci 2000a; Vansteenkiste et al. 2010): (1) *autonomy*, (2) *relatedness* and (3) perceived *competence*. Fulfilling these needs is essential for human to thrive and for their well-being. Thwarting BPN can result in maladjustment and even

psychopathology (Ryan and Deci 2000b; Vansteenkiste and Ryan 2013). BPNT is universal across cultures and countries which means that satisfaction of the BPN is an essential nutrient for optimal functioning of human beings to optimally function irrespective of cultural and individual differences (Bartholomew et al. 2011; Chen et al. 2015).

Fulfilling the need of autonomy refers to the experience of sovereignty and feeling of choice while carrying out an activity. Frustration of autonomy would involve feeling controlled due to external pressures. Fulfilling the need of relatedness refers to the experience of belonging and connection to others, while frustrating the need of relatedness refers to feeling lonely and excluded. Finally, fulfilling the need of competence refers to feeling effective and capable of achieving desired outcomes, whereas frustrating the need of competence refers to feelings of failure.

Satisfying the three BPN is related with better learning outcomes, vitality and well-being and frustrating these needs is associated with bad learning behaviors like procrastination, test-anxiety and ill-being. Therefore, it is expected that satisfying the needs of autonomy, relatedness and competence would be positively related to AM and frustrating them would be positively related to CM (Ryan and Deci 2017; Ryan et al. 2010; Bartholomew et al. 2011).

Motivation in pharmacists

Pharmacists' motivation in CE has previously been studied using SDT as a theoretical framework (Tjin A Tsoi et al. 2016a, b). Based on the quality of their motivation in CE four different profiles seemed to emerge in pharmacists: (1) good quality (high AM and low CM), (2) high quantity (high AM and high CM), (3) poor quality (low AM and high CM) and (4) low quantity (low AM and low CM) (Tjin A Tsoi et al. 2016a). In addition, motivation seemed to play a role in their CE participation, as well as other factors such as pharmacy school, traineeship and work experience (Tjin A Tsoi et al. 2016b). A longitudinal study executed with the same sample showed that RAM decreased over a 21-month period (Tjin A Tsoi et al. 2017). It is difficult to attribute these changes solely to the CE system that the pharmacists participated in because contemporary pharmacy practice is also influenced by increased external pressures from governments and societies (Schaufeli 2014). Both community and hospital pharmacists have had to adjust to numerous changes in the Netherlands in the last decade. For instance insurance companies have started dictating the drug distribution and therefore changing drug governance, and a transition from traditional drug-related care to patient care has occurred. Consequently, new knowledge and different skills are being demanded from pharmacists. In addition, community pharmacists were recently (2016) acknowledged as specialists just like general practitioners (1973) and hospital pharmacists (1998). Together with the findings of earlier studies about pharmacists' motivation in CE, this study could be used to assess the current CE system for pharmacists in the Netherlands and to investigate possible strengths and weaknesses of the current CE system in terms of pharmacists' motivation. Moreover, this current time frame creates an excellent opportunity to redesign a CE/CPD system geared to stimulate AM and prevent the increase of CM.

In light of the increasing percentage (approximately 30%) of burnout (ill-being) in Dutch pharmacists (Schaufeli 2014), it has become urgent to re-energize this group. Well-being has been measured in earlier studies with subjective vitality as an indicator and represents the "brighter" side of human existence (Ryan and Frederick 1997; Ryan and Deci 2000b). Subjective vitality is defined as a positive feeling of having available energy from the self (Ryan and Frederick 1997). Ill-being/burnout, on the other hand, refers to the

“darker” side (Ryan and Deci 2000b). According to SDT, tools for re-energizing pharmacists can be discovered by understanding how BPN and motivation in CE/CPD relate to well-being and learning outcomes.

To our knowledge there is no earlier study that has elaborated on these relations in the learning context (CE/CPD system) of healthcare professionals. The objective of the present study is to investigate a complete route (consisting of an upper “bright” and a lower “dark” side) from predictors to outcome with the possible associations between pharmacists’ BPN in CE, their academic motivation, well-being and learning outcomes.

Hypotheses

We constructed the following hypotheses on the basis of the literature, and expect a model for this study as suggested in Fig. 1.

Hypothesis 1 Satisfying BPN is associated with an increase in AM (directly), an increase in well-being (directly and indirectly through AM) and an improvement in learning outcomes (directly and indirectly).

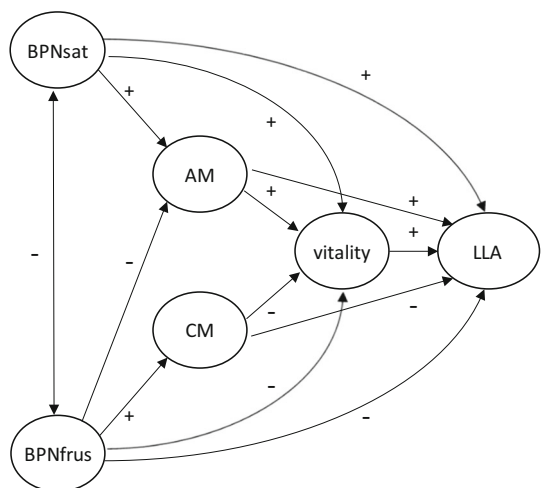
Hypothesis 2 Frustrating BPN is associated with a decrease in AM (directly), increase in CM (directly), decrease in well-being (directly and indirectly through Academic Motivation) and decrease in learning outcomes (directly and indirectly).

Hypothesis 3 An increase in AM is associated with an increase in well-being (directly) and learning outcomes (directly and indirectly).

Hypothesis 4 An increase in CM is associated with a decrease in well-being (directly) and learning outcomes (directly and indirectly).

Hypothesis 5 An increase in well-being is directly associated with an increase in learning outcomes.

Fig. 1 Hypothesized model of a pathway from basic psychological needs to learning outcomes



Methods

Setting

This study was conducted among 425 Dutch pharmacists working in a community or hospital pharmacy that participated in CE courses organized by the Netherlands Centre for Post-Academic Education in Pharmacy. *In June 2015 Pharmacists were invited to fill out four questionnaires administered in one online survey. Between June 2015 and September 2015, three reminders were sent.*

CE/CPD of Pharmacists in the Netherlands

After graduating from pharmacy school, Dutch pharmacists can continue with two types of postgraduate training acknowledged by the ministry. The first one is a residency program of 2 years to become a registered community pharmacist (CP) and the second one is a residency program of 4 years to become a registered hospital pharmacist (HP).

Both CPs and HPs are required to participate in accredited CE activities for at least 200 h starting at registration and every 5 years thereafter. Examples of accredited CE activities are lectures, workshops and conferences, but also e-learning and blended learning courses. Learning through peer groups with general practitioners and pharmacist colleagues and teaching and writing papers can also individually be accredited afterwards.

The regulations for CPs were revised in 2015, and Dutch pharmacists are now required to participate in CE according to the CanMEDS competency framework. For instance, training in competencies like collaboration and communication should cover at least 40 h in 5 years. The new regulations for CPs also include assessment driven/reflective learning as an extra requirement (a minimum of 10 h and a maximum of 50 h in 5 years).

Measures

The original instruments, which were constructed in English, were modified according to the adaptation guidelines for questionnaires (Beaton et al. 2000) to fit the CE context and translated into Dutch. Next, the translated questionnaires were assessed by a group of five experts in the field consisting of pharmacists and educators in pharmacy. The feedback given by the pharmacists and educators, mostly about terminology, was processed in the final questionnaires.

Academic motivation

The Academic Motivation Scale (AMS) a 7-factor 28-item scale (Vallerand et al. 1992) was used to assess academic motivation. The different dimensions of academic motivation like identified and external regulation were measured by items such as “because I believe CE will improve my competencies as a professional” and “to prove to myself that I am capable of succeeding in CE”, respectively. Responses were scored on a five-point scale from 1, representing “totally disagree” to 5, representing “totally agree”.

Basic psychological need (BPN) satisfaction and frustration

To assess basic psychological need satisfaction (BPNsat) and frustration (BPNfrus) of the pharmacists in the context of CE, we used a 6-factor 24-item scale that was validated across four cultures (Chen et al. 2015). The stem was: “We would like to measure your feelings and experiences about CE in general”. Need satisfaction and need frustration items were both categorized by autonomy, competence and relatedness. Examples are “I feel I have been doing what really interests me” (autonomy satisfaction), “I feel insecure about my abilities” (competence frustration) and “I experience a warm feeling with the people I spend time with” (relatedness satisfaction). Responses were scored on a five-point scale from 1, representing “totally disagree” to 5, representing “totally agree”.

Vitality

Because vitality is an important indicator of well-being we used the 7-item subjective Vitality Scale from Ryan and Frederick (1997). We used only one of the two levels measured by this questionnaire, wherein the scores indicate the degree to which the statement represents the general vitality. Statements like “I feel alive and vital” and “I have energy and spirit” were scored on a seven-item scale: 1 representing “not at all true” and 7 representing “very true”.

Lifelong learning and adaptability (LLA)

Owing to the context of our study, we used only one of the four domains, namely Lifelong Learning and Adaptability (LLA), from the Professionalism Assessment Tool which has a total of eight items (Kelley et al. 2011). Examples of topics proposed were: e.g. “Recognizing limitations and seeking help” and “Please score your overall level of performance in Lifelong Learning and Adaptability”.

Responses were rated on a five-point scale: (1) knows (I understand these responsibilities, but may perform one or more inconsistently, at times), (2) knows how (I understand these responsibilities and perform them in a reliable, consistent and accountable manner), (3) shows (Without prompting or support from instructors, preceptors or managers, I determine when and how to engage in these responsibilities), (4) shows how (I am confident in assisting others with these responsibilities or proposing or creating options to fulfill these responsibilities and (5) teaches how (I have mastered these responsibilities and desire to learn more and share my learning with others. I demonstrate maturity, confidence and an ability to educate others in these areas through the use of evidence and strong interpersonal skills).

Statistical analyses

For the descriptive statistics and primary analyses we used SPSS version 23. A Structural Equation Modelling (SEM) approach was performed in R (version 1.0.136 Lavaan package) using Maximum Likelihood by default. The reliability of the measurements with the questionnaires was tested by calculating their Cronbach’s alphas. The SEM model fit criteria used were: Root Mean Square Error of Approximation (RMSEA) < 0.05, Standardized Root Mean Square Residual (SRMR) max 0.08, Comparative Fit Index

(CFI) > 0.90, Tucker–Lewis Index (TLI) > 0.90 (Schreiber et al. 2006; Barrett 2007; Hooper et al. 2008).

Ethical approval

Anonymity was ensured and informed consent was obtained from all participants. Ethical approval was granted by the Dutch Medical Education association (NVMO): folder 262 and amendment 497.

Results

One hundred and nine pharmacists completed the four questionnaires which resulted in a response rate of 26%. Table 1 presents the demographics of the pharmacists who completed all questionnaires ($n = 109$) versus the larger sample ($n = 425$).

Primary analyses

For every questionnaire, as well as each subscale, Cronbach's alphas were calculated. With a range from 0.73 to 0.90 (AMS: 0.90; BPN: 0.73; LLA: 0.87; Vitality: 0.90) the reliabilities of the scales were acceptable (Nunnally and Bernstein 1994; Suhr and Shay 2009).

Table 1 Demographics of the pharmacists who completed all questionnaires ($n = 109$) versus the larger sample ($n = 425$)

Factor variable	This study, n (%)	Large population, n (%)
Gender		
Females	71 (65.1)	245 (57.6)
Males	38 (34.9)	147 (34.6)
Unknown		33 (7.8)
Pharmacy school		
Utrecht	58 (53.2)	220 (51.8)
Groningen	42 (38.5)	165 (38.8)
Other or unknown	9 (8.4)	41 (9.6)
Working environment		
Community pharmacy	50 (45.9)	220 (51.8)
Hospital pharmacy	51 (46.8)	193 (45.4)
Other or unknown	8 (7.3)	12 (2.8)
Working experience		
> 10 year	36 (33.0)	160 (37.6)
< 10 year	65 (59.6)	260 (61.2)
Unknown	8 (7.4)	5 (1.2)
Traineeship		
Not in training	75 (68.8)	285 (67.0)
In training	33 (30.3)	118 (27.8)
Unknown	4 (0.9)	22 (5.2)

Descriptive statistics and correlations among the study variables

Table 2 reports the mean scores on the different variables in relation to the demographics. Only in the categories of working experience and training status did we observe statistically significant differences in mean scores on motivation (AM and CM). For example, pharmacists with working experience of 10 years or less scored higher on CM ($M = 2.45$, $SD = 0.76$) than pharmacists with working experience of 10 years and higher ($M = 1.96$, $SD = 0.74$). Statistically significant differences in mean scores on BPNfrus and BPNsat were observed in the categories of gender and working environment. For example, females on average had lower levels of satisfaction of basic needs ($M = 3.69$, $SD = 0.44$) than males ($M = 3.96$, $SD = 0.67$) and pharmacists working in a community pharmacy scored higher on frustration of BPN ($M = 2.03$, $SD = 0.59$) than pharmacists working in a hospital pharmacy ($M = 1.86$, $SD = 0.51$). Furthermore, gender also showed a statistically significant difference in the mean score on vitality. For example, females on average had lower levels of vitality ($M = 4.64$, $SD = 1.09$) than males ($M = 5.21$, $SD = 1.14$). No statistically significant difference was seen in the mean scores on LLA in relation to demographic categories.

Table 3 represents the Pearson's correlation of the scores on the different variables (BPNsat, BPNfrus, AM, CM, Vitality and LLA) from the four questionnaires. Significant negative correlations were found between BPNsat and BPNfrus (-0.373 , $p < 0.01$), between CM and Vitality (-0.225 , $p < 0.05$) and between BPNfrus and Vitality (-0.610 , $p < 0.01$). Statistically significant positive correlations were found between BPNsat and AM (0.234 , $p < 0.05$), BPNsat and Vitality (0.398 , $p < 0.05$), BPNsat and LLA (0.297 , $p < 0.01$). BPNfrus was positively correlated with both AM (0.198 , $p < 0.05$) and CM (0.401 , $p < 0.01$). Vitality was positively correlated with LLA (0.352 , $p < 0.01$).

Structural equation models

We have followed the five-step procedure of Violato and Hecker (2007). The first step of Violato defines the research problem and hypothesized model, based on substantial studies in SDT (Fig. 1). In the second step and third step we conducted various factor analyses and path analyses of the variables from the different questionnaires and tried to fit the hypothesized model, but we couldn't find a good model fit (non-convergence) for our dataset. The goodness of fit (step 4) was determined based on the model fit indices for this model: $\chi^2 = 3152.05$ ($df = 1866.00$, $p = 0.00$), $CFI = 0.65$, $TLI = 0.63$, $RMSEA = 0.08$ and $SRMR = 0.11$. After evaluating the poor fit (step 5) and based on the lack of significant correlations among some of the study variables (Table 2) we suspected that a good model fit for the hypothesized model was unlikely (Fig. 1). However, we did expect to find an acceptable model fit for the lower part (BPNfrus–CM–Vitality–LLA) of the hypothesized model because of the significant correlations between these variables.

Next, we decided to analyze the data step by step to understand our negative findings. The model fit for the Vitality–LLA model was good: $\chi^2 = 100.36$ ($df = 89.00$, $p = 0.19$), $CFI = 0.98$, $TLI = 0.98$, $RMSEA = 0.04$ and $SRMR = 0.06$. Because AM did not correlate significantly with Vitality we split the model into upper and lower parts and performed SEM only on the lower part (CM–Vitality–LLA) of the model (represented in bold font in of Fig. 2). The model fit for this part was acceptable with $\chi^2 = 285.57$ ($df = 227.00$, $p = 0.01$), $CFI = 0.95$, $TLI = 0.94$, $RMSEA = 0.05$ and $SRMR = 0.08$.

Table 2 Means \pm standard deviations of the variables autonomous motivation (AM), controlled motivation (CM), basic need satisfaction (BPNsat) and basic need frustration (BPNfrus), vitality and lifelong learning and adaptability (LLA). AM, CM, BPNsat, BPNfrus and LLA were measured on a 5-point scale and Vitality on a 7-point scale. Comparisons between group means were assessed with students' t-test; not significant = $p > 0.05$

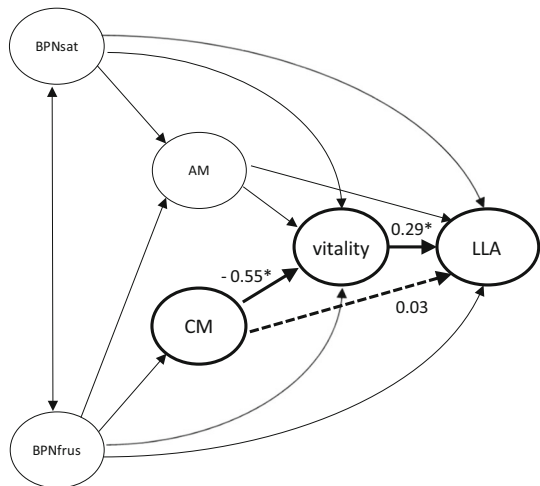
	N	AM	CM	BPNsat	BPNfrus	Vitality	LLA
Gender							
Male	38	3.37 \pm 0.63	2.17 \pm 0.80	3.96 \pm 0.67	1.75 \pm 0.53	5.21 \pm 1.14	2.97 \pm 0.74
Female	71	3.50 \pm 0.60	2.30 \pm 0.79	3.69 \pm 0.44	2.00 \pm 0.56	4.64 \pm 1.09	2.97 \pm 0.74
		n.s.	n.s.	$p = 0.019$	$p = 0.038$	$p = 0.018$	n.s.
Working environment							
Community pharmacy	50	3.43 \pm 0.55	2.40 \pm 0.79	3.67 \pm 0.60	2.03 \pm 0.59	4.71 \pm 1.13	2.90 \pm 0.77
Hospital pharmacy	51	3.54 \pm 0.69	2.16 \pm 0.79	3.84 \pm 0.47	1.86 \pm 0.51	4.91 \pm 1.14	3.04 \pm 0.77
Other	8						
		n.s.	n.s.	n.s.	$p = 0.035$	n.s.	n.s.
In training							
Yes	33	3.61 \pm 0.62	2.50 \pm 0.74	3.67 \pm 0.42	1.97 \pm 0.45	4.95 \pm 1.09	3.09 \pm 0.62
No	72	3.40 \pm 0.60	2.17 \pm 0.79	3.83 \pm 0.59	1.90 \pm 0.60	4.82 \pm 1.11	2.95 \pm 0.82
Other/unknown	4						
		n.s.	$p = 0.035$	n.s.	n.s.	n.s.	n.s.
Working experience							
< 10 year	65	3.58 \pm 0.55	2.45 \pm 0.76	3.78 \pm 0.46	1.98 \pm 0.57	4.86 \pm 1.12	2.96 \pm 0.64
> 10 year	36	3.23 \pm 0.68	1.96 \pm 0.74	3.76 \pm 0.68	1.81 \pm 0.55	4.87 \pm 1.07	3.02 \pm 0.96
Other/unknown	8						
		$p = 0.006$	$p = 0.002$	n.s.	n.s.	n.s.	n.s.
Pharmacy school							
Utrecht	58	3.49 \pm 0.64	2.22 \pm 0.79	3.83 \pm 0.47	1.86 \pm 0.50	4.88 \pm 1.06	3.03 \pm 0.68
Groningen	42	3.44 \pm 0.57	2.33 \pm 0.81	3.72 \pm 0.57	1.92 \pm 0.53	4.94 \pm 1.10	2.95 \pm 0.83
Other/unknown	9						
		n.s.	n.s.	n.s.	n.s.	n.s.	n.s.

Table 3 Pearson’s correlation of the study variables basic psychological need satisfaction (BPNsat), basic psychological need frustration (BPNfrus), autonomous motivation (AM), controlled motivation (CM), vitality and lifelong learning and adaptability (LLA)

	1	2	3	4	5
BPN satisfaction	1				
BPN frustration	-.373**	1			
AM	0.234*	0.198*	1		
CM	-.009	0.401**	0.546**	1	
Vitality	0.398*	-.610**	-.092	-.225*	1
LLA	0.297**	-.165	0.018	-.122	0.352**

* $p < 0.05$, ** $p < 0.01$

Fig. 2 Structural relations found between controlled motivation (CM), vitality and lifelong learning and adaptability (LLA). Statistically significant relations are represented by continuous lines; broken lines are statistically not significant ($p > 0.05$)

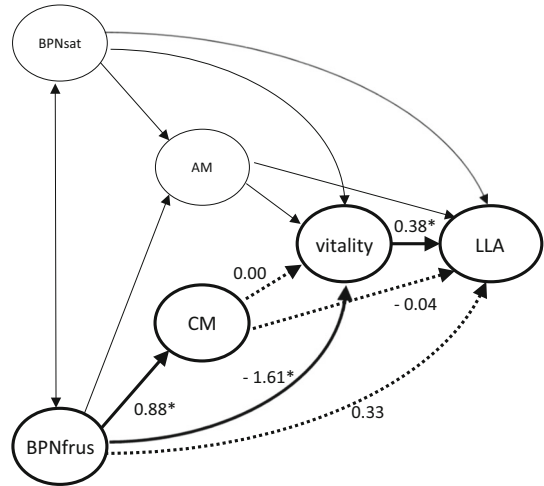


In Fig. 2, the part, represented in bold, was tested and represents the structural part of the model found.

Based on SDT literature we know that motivation is influenced by satisfying or frustrating BPN. Therefore we wanted to determine how BPN influenced CM, Vitality and LLA. Since only the correlations between the BPN frustration and CM were significant we ran the following model: BPNfrus–CM–Vitality–LLA with indirect (through CM) and direct effects of BPNfrus on Vitality and LLA (represented in bold font in Fig. 3). Model fit parameters showed an acceptable model fit: $\chi^2 = 666.73$ (df = 550.00, $p = 0.00$), CFI = 0.93, TLI = 0.92, RMSEA = 0.05 and SRMR = 0.08. In Fig. 3 the bold part was tested and represents the structural part of the model found.

Our results show that we could not find a good model fit for the hypothesized model, but we did find an acceptable model fit for the CM–Vitality–LLA model (Fig. 2) and for the BPNfrus–CM–Vitality–LLA model (Fig. 3). The model in Fig. 2 shows a significant negative direct effect of CM on vitality (– 0.55) and indirect effect on LLA (through vitality) and a significant positive direct effect of vitality on LLA (0.29). A significant direct effect of CM on LLA could not be found. The model in Fig. 3 shows that the

Fig. 3 Structural relations found between basic psychological needs frustration (BPNfrus), controlled motivation (CM), vitality and lifelong learning adaptability (LLA). Statistically significant relations are represented by continuous lines; broken lines are statistically not significant ($p > 0.05$)



BPNfrus did not indirectly affect vitality through CM. It did, however, directly affect the CM significantly positively (0.88), directly affect vitality significantly negatively (-1.61) and indirectly affect LLA through vitality negatively. Vitality also directly affected LLA significantly positively (0.38).

Discussion

In this study we have used SDT as the theoretical framework. Based on earlier motivation studies in education we hypothesized a model of a pathway from BPN to learning outcomes like vitality and LLA (Fig. 1) (Ryan and Deci 2000b; Haerens et al. 2015; Gnambs and Hanfstingl 2015; Olafsen et al. 2017). This model distinguishes “bright” (desirable) and “dark” (less-desirable) pathways in an integrated model.

The measurements (AM, CM, BPNfrus, BPNsat, vitality and LLA) used in this study were collected through validated questionnaires originating from SDT research and research in professionalism assessment among pharmacists. Our hypothesized model showed a two-sided pathway from BPN to learning outcomes. However, we couldn’t find a good fit for the complete model. Although the number of cases were sufficient for SEM, we think our model was too complex for the small dataset because of the competing inter-relations among the different variables. Therefore, we decided to test only the lower part of the model, which predicted significant (Pearson’s) correlations between the variables (Table 3).

In our dataset we could find support for structural relationships on the lower “dark” side between frustration of BPN, CM, Vitality and LLA (Fig. 3). In this model we could not confirm the mediating role of CM between BPNfrus (predictors) and vitality (outcome). The BPN seem to only indirectly affect LLA through vitality and not directly. Of our constructed five hypotheses, we only found evidence for: (a) a part of hypothesis 2 [frustrating BPN is associated with an increase in CM (directly), a decrease in well-being (directly) and a decrease in learning outcomes (indirectly)], (b) a part of hypothesis 4 [an increase in CM is associated with a decrease in well-being (directly) and learning outcomes

(indirectly)], shown in Fig. 2 and (c) hypothesis 5 (an increase in well-being is directly associated with an increase in learning outcomes).

In the first model (CM–Vitality–LLA, Fig. 2), CM is a predictor and independent variable and vitality serves as a mediator for LLA. Unlike earlier studies (Kusurkar et al. 2013) that found that Relative Autonomous Motivation (RAM) was directly structurally related to learning outcomes like good study strategies and that RAM was indirectly related to academic performance through good study strategies and more study effort, we could not find a direct structural relationship between CM and LLA. However, we did find an indirect effect of CM through vitality on LLA. Adding the frustration of the BPN as a variable in the model results in the second model (Fig. 3) and shows that frustration of the BPN had a more important direct structural relationship with vitality (-1.61) at the expense of the former structural relationship found in the first model between CM and vitality directly (-0.55) and between CM and LLA indirectly. Our findings suggest that frustration of BPN could be an important negative predictor for vitality/well-being (directly) and LLA (indirectly) in pharmacists. Satisfying or frustrating BPN as possible predictors for psychological functioning and learning outcomes are supported by earlier studies conducted in different contexts with workers, athletes and across different cultures within SDT (Ryan and Deci 2000b; Ryan et al. 2010; Bartholomew et al. 2011; Chen et al. 2015).

Vitality (energy) played an important role in learning outcomes in our study context. This role could be the result of external pressures from the government and health insurance companies together with the credit-focused system the pharmacists were in at the time of the study. At that time (2015) a quickscan conducted on “passion in healthcare” in the Netherlands reported one out of three pharmacists suffered from burnout (Schaufeli 2014).

The positive direct relationship between BPNfrus and CM (0.88), the negative direct relationship between BPNfrus and vitality (-1.61) and the positive direct relationship between vitality and LLA (0.38) in our model in Fig. 3 align with SDT and are supported by other SDT studies using structural equation modelling (Kusurkar et al. 2013; Haerens et al. 2015; Olafsen et al. 2017).

Unexpectedly, we found that frustrating BPN was significantly positively correlated ($0.198, p < 0.05$) to AM. However, we also found that frustrating BPN was positively correlated to CM ($0.401, p < 0.01$), satisfying BPN was positively correlated to AM ($0.234, p < 0.05$) and that BPNfrus and BPNsat were negatively correlated ($-0.373, p < 0.01$) as expected based on SDT. By running more detailed analyses, we found that a subgroup with high quantity motivation (high scores on both AM and CM) exists ($n = 31$) in our dataset that may explain the positive correlation between BPN frustration and AM. The autonomy scores on BPNsat ($M = 3.79, SD = 0.50$) and BPNfrus ($M = 2.61, SD = 0.68$) from this group were both higher than the average scores of 3.59 for BPNsat and 2.45 for BPNfrus.

In our dataset we also identified a subgroup with a very high correlation ($0.82, p < 0.01$) between AM and CM compared to the correlation with the whole dataset ($0.55, p < 0.01$). This could indicate that the distinction between AM and CM in this specific group is not very clear and therefore statistically explains an overall positive correlation between BPN frustration and AM. An explanation of this phenomenon could be that the scores on BPN frustration questions like “I feel obligated to do most of the things that I do in CE” and “I feel forced to do things that I wouldn’t otherwise do by choice” are high in an obligatory CE system like ours even though people have high AM or both high AM and CM.

Implications for practice

Satisfaction of BPN has often been studied in relation to autonomy-supportive teaching (Vansteenkiste et al. 2004; Guay et al. 2008). However, the previously studied educational contexts differ from ours because autonomy-support could be provided in a structured environment like a high school or university. In our context, the measured basic needs were related to the national CE system and did not depend only on teaching styles and school regulations. BPN satisfaction also depends on teaching styles and the CE formats of CE providers which the current CE system cannot influence.

Increasing the satisfaction and decreasing the frustration of the BPN (autonomy, relatedness and competence) can contribute to a sustainable, vitalizing and motivating CE/CPD system. Our findings suggest that preventing BPN frustration is important for the well-being and learning outcomes of pharmacists. To design a teaching and learning CE system that will be fully autonomy-supportive, CE providers and regulators need to collaborate. Together they could identify learner needs, develop autonomy-supportive formats/regulations for CE and encourage the learners to take responsibility for learning. Consequently, educational formats with optimal challenges and choices in learning (Fig. 4) could lead to more positive well-being of pharmacists and better learning outcomes in CE and thus better patient care (Kusurkar et al. 2011).

Limitations and future research

Although the AMS is a widely used and validated scale in different contexts, this is the first time that it has been used in CE for healthcare professionals. This could be considered a limitation of the study. Even though we found acceptable reliabilities (based on the Cronbach's alphas) for the AMS subscales, we recommend the construction of a new scale with specific construct validity for measuring the quality of motivation among health professionals.

SDT is known as a universal theory that is validated cross-culturally and in many life domains, however, we do recommend further research in other healthcare professions, like physicians in other global professional development systems, to determine the generalizability of our findings.

Although the response rate was low (26%), extrapolation of the findings to the larger group seems justifiable because of the demonstrated representativeness of the sample of

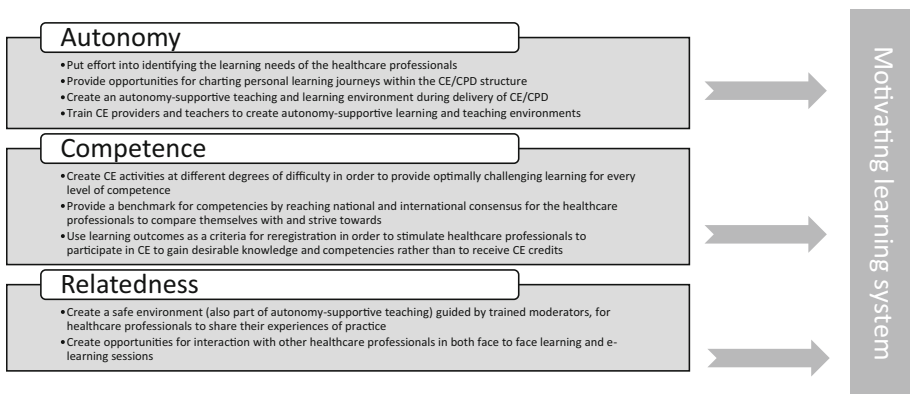


Fig. 4 Tips for designing a motivating CE/CPD system for health professionals using basic psychological needs

109 cases (Table 1). Although response rates around 20% are acceptable for electronic surveys and there were enough cases for SEM, we recommend collecting more data for future research.

During our research it was not possible to measure actual performance or learning outcomes independently in our population. We therefore used self-assessment scales like LLA which might bias the results we found.

Because our findings suggest that BPN play an important role as predictors for psychological functioning and good learning outcomes, questions for future research are: “What are the pharmacists’ needs for CE?” and “How can we ensure the satisfaction of these needs and prevent their frustration?”

Conclusion

Our findings, supported by SDT literature, suggest that BPN are important predictors for well-being and learning outcomes, because frustration of BPN is negatively related to vitality (directly) and to learning outcomes in CE (indirectly). Further research should be conducted to discover how we can prevent these needs from being frustrated in order to design a motivating, vitalizing and sustainable CE/CPD system for pharmacists and other healthcare professionals.

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Appendix

Table model results and fit measures Figs. 2 and 3

Variable	Estimate	SE	<i>p</i>
Model results (Fig. 2)			
LLA–vitality	0.29	0.08	0.00
Vitality–CM	– 0.55	0.16	0.00
LLA–CM	0.03	0.10	0.75
Model results (Fig. 3)			
LLA–vitality	0.38	0.13	0.00
Vitality–CM	0.00	0.12	0.97
LLA–CM	– 0.04	0.08	0.67
LLA–BPNfrus	0.33	0.31	0.29
Vitality–BPNfrus	– 1.61	0.39	0.00
CM–BPNfrus	0.88	0.25	0.00

Model	Chi square (df)	CFI	TLI	RMSEA	SRMR
Fit measures					
Figure 2	285.47 (226.00)	0.95	0.94	0.05	0.08
Figure 3	665.57 (549.00)	0.93	0.92	0.05	0.08

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