

# Motivational Mechanisms Underlying Physicians' Occupational Health: A Self-Determination Theory Perspective

Moller, Arlen C.<sup>1</sup>; Olafsen, Anja Hagen<sup>2</sup>; Jager, Andrew J.<sup>3</sup>; Kao, Audiey C.<sup>4</sup>; Williams, Geoffrey C.<sup>5,6</sup>

<sup>1</sup>Illinois Institute of Technology, Chicago, IL, USA

<sup>2</sup>University of South-Eastern Norway, Kongsberg, Norway

<sup>3</sup>AHA Center for Health Innovation, Chicago, IL, USA

<sup>4</sup>American Medical Association, Chicago, IL, USA

<sup>5</sup>Billings Clinic, Billings, Montana

<sup>6</sup>University of Rochester Medical Center, Rochester, NY, USA

This is an Accepted Manuscript of an article accepted for publication by Sage Journals in *Medical Care Research and Review*, published on April 28, 2021, version of record: <https://doi.org/10.1177/10775587211007748>

Moller, A. C., Olafsen, A. H., Jager, A. J., Kao, A. C. & Williams, G. C. (2022). Motivational Mechanisms Underlying Physicians' Occupational Health: A Self-Determination Theory Perspective. *Medical Care Research and Review*, 79(2), 255-266. <https://doi.org/10.1177/10775587211007748>

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# Medical Care Research and Review

## **Motivational Mechanisms Underlying Physicians' Occupational Health: A Self-Determination Theory Perspective**

Journal:	<i>Medical Care Research and Review</i>
Manuscript ID	MCCR-2019-0186-ER.R3
Manuscript Type:	Empirical Research
Keywords:	intrinsic aspirations, occupational health, psychological need satisfaction, autonomous work motivation, physician burnout

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Running title: Physicians' Intrinsic Aspirations & Occupational Health

### ABSTRACT

Numerous studies have documented deteriorating occupational health among practicing physicians. This trend poses a serious risk for physicians but also for the many patients under their care. Past research finds that one protective factor involves the quality of physicians' motivation. When physicians are more autonomously motivated, they tend to experience better occupational health. However, few studies have identified antecedent factors that support physicians' autonomous work motivation. To identify and model potential root causes of physicians' autonomous work motivation and occupational health, the current study assessed physicians' intrinsic aspirations and need satisfaction at work. Hypotheses were tested in a sample of 2,116 U.S. practicing physicians. Structural equation modeling showed that physicians who endorsed intrinsic aspirations more strongly reported better occupational health, and that this association was mediated by physicians' need satisfaction and autonomous work motivation. Implications for designing more effective individual- and systems-level interventions to improve physician occupational health are discussed.

Word count (abstract): 150 (max 150)

Keywords: intrinsic aspirations; occupational health; psychological need satisfaction, autonomous work motivation

The work that physicians do is socially valued and personally vitalizing. Yet a large and growing body of evidence reveals physicians' occupational health at serious risk (Chen, Ran, Zhang, et al., 2019; The Lancet, 2019), and particularly, in the United States (Thomas, Ripp, & West, 2018). Occupational health can be viewed as a broad set of mental, physical, and behavioral health indicators tied to work. While estimates of physicians' work-related burnout and depression vary as a function of assessment methods and study quality (Rotenstein et al., 2018), many larger and more rigorous studies find that physicians report high levels of both (Shanafelt et al., 2015, 2019). Poor occupational health among practicing physicians is also observed in trainees. Meta-analyses have found elevated prevalence of depression or depressive symptoms among resident physicians (28.8%: ranging from 20.9% to 43.2%; Mata et al., 2015), as well as elevated risk for depression or depressive symptoms (27.2%) and suicidal ideation (11.1%) among medical students (Rotenstein et al., 2016).

Guided by conservation of resource theory, a recent systematic review by Williams and colleagues (2020) framed physician burnout as a dynamic loss spiral that unfolds over time (i.e., a "burnout cascade"). They found that one component of burnout, emotional exhaustion, had the greatest impact on downstream occupational health outcomes, relative to other components of burnout (depersonalization and lack of professional accomplishment). In addition to outcomes directly experienced by physicians (distress and despair), Williams et al.'s systematic review looked at a physician's work activity, finding associations between burnout and reduced empathy for patients, declining to take on activities beyond their basic practices, and higher intentions to leave their job or their profession. Fewer studies have investigated whether a negative association exists between physician burnout and quality of patient care, and those studies have produced mixed findings. A 2017 systematic review reported moderate evidence linking physician burnout with safety-related quality of care, and mixed support linking burnout with patient acceptability-related quality of care (Dewa,

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2  
3 Loong, Bonato, & Trojanowski, 2017). Another 2018 systematic review by Rathert et al.  
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5 (2018) found physicians self-reported burnout was correlated with self-reported errors, but  
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7 now with independent clinical outcomes. Similarly, Rathert et al.'s review found that burnout  
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9 was related to lower patient ratings of care, but not with specific behaviors.  
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12 Collectively, the literature suggests that physician burnout is a problem that has  
13  
14 cascading, and potentially wide-ranging implications, especially for physicians themselves,  
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16 and potentially for patients too. For these reasons, Noseworthy and colleagues (2017) have  
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18 called physician burnout a public health crisis, and called on health system leaders to invest  
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20 more resources toward studying and addressing this growing problem. As Shanafelt, Goh, and  
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22 Sinsky (2017) pointed out, there are both moral and economic arguments for investing more  
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24 resources into protecting physicians' well-being – but how should those resources be  
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26 invested?  
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30 Unfortunately, past investments in physicians' occupational health have had relatively  
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32 limited effectiveness. Most interventions have been short in duration and focused at the  
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34 individual-level (e.g., mindfulness-based stress reduction trainings; Krasner et al., 2009),  
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36 returning short-term benefits. In recognition of these limitations, an expert panel convened by  
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38 the National Academies of Sciences, Engineering, and Medicine (2019) recently concluded  
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40 that systems-level (rather than individual-level) reforms are needed to improve physicians'  
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42 deteriorating occupational health. This report outlines many specific reforms that could be  
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44 considered. While expansive in scope, the National Academies report lacked any overarching  
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46 theoretical framework to guide both understanding and implementation. A well developed,  
47  
48 empirically-supported theory can: support cohesive, big picture thinking; facilitate knowledge  
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50 transfer from past research contexts; and help researchers identify promising new hypotheses.  
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52 Furthermore, applying a well-developed theory can facilitate the task of evaluating and  
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54 refining complex, and typically slow-moving, systems-level interventions or changes. While  
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3 physicians' occupational health (and ultimately population health) may be the primary target  
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5 of a systems-level intervention, the effect of a system-level change may take months or years  
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7 to unfold; more proximal psychological variables identified by a well-developed theory may  
8  
9 be swifter to change, providing opportunities for ongoing evaluation and optimization.

## 12 **New Contributions**

14  
15 The present research fills important gaps by introducing a macro-theory of human  
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17 motivation, self-determination theory (SDT), as a framework for understanding physicians'  
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19 occupational health, and by testing a series of SDT-informed hypotheses. One of the SDT-  
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21 informed hypotheses tested relates to a claim that healthcare professionals have widely  
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23 asserted for decades using only intuition and anecdotal evidence (Peabody, 1927; Schwenk,  
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25 2018). That is, many have claimed that intrinsic aspirations (i.e., life goals that include  
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27 helping others and personal growth) fundamentally support the occupational health of  
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29 physicians. The current research evaluates several models linking physicians' intrinsic  
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31 aspirations to occupational health. Specifically, based on SDT, physicians' intrinsic  
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33 aspirations and psychological need satisfaction at work were identified as potential  
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35 antecedents of autonomous motivation and occupational health, and modeled using a large  
36  
37 and representative sample of working U.S. physicians. This empirical, cross-sectional  
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39 investigation represents an important step toward providing justification for significant future  
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41 investments in costly implementation of multi-level interventions designed to promote  
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43 physicians' occupational health, and longitudinal assessments of their effectiveness. In the  
44  
45 general discussion, we offer suggestions for how our findings could be used by health services  
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47 researchers, policymakers, managers, and practitioners interested in promoting physicians'  
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49 occupational health and achieving maximum return on investment.

## 56 **Theory**

### 58 Self-determination theory, work motivation, & occupational health

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2  
3 Self-determination theory (SDT; Deci & Ryan, 2000; Ryan & Deci, 2017) is a  
4  
5 motivational macro theory that has gained wide attention in organizational psychology in  
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7 terms of explaining the implications of work environments and work characteristics on  
8  
9 employees motivation, work functioning, and occupational health (for a review, see Olafsen,  
10  
11 & Deci, in press). In particular, SDT's important contribution to this field lies in its focus on  
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13 goals, basic psychological needs, and qualities of motivation as central organizing principles  
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15 explaining the implications of individual- and system-level work factors on workers'  
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17 functioning and well-being.  
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20  
21 One of the major distinctions drawn by SDT is between two qualities of motivation:  
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23 autonomous and controlled (Ryan & Deci, 2017). Autonomous motivation is characterized by  
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25 feeling free and fully endorsing one's actions. By contrast, controlled motivation is  
26  
27 characterized by feeling pressured by external or internal forces. Both forms have the  
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29 potential to very powerfully motivate human behavior and, in many contexts, each have  
30  
31 fueled high level achievements. That said, decades of research findings suggest that  
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33 autonomous motivation is frequently more adaptive than controlled motivation in a variety of  
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35 ways – in particular, in terms of associated mental and physical health, but also in terms of  
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37 sustained effort, learning, and creativity (for a review, see: Ryan & Deci, 2018).  
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43 In a wide range of different work and organizational settings, autonomous motivation  
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45 has been consistently associated with superior occupational health (Olafsen & Deci, 2020).  
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47 Furthermore, a number of studies have investigated the association between work motivation  
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49 and occupational health, specifically, among physicians and other health care workers. An  
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51 earlier paper using a more limited data set from the current study's sample provided  
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53 validation of a revised measure of work motivation tailored for physicians (i.e., the Physicians  
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55 Work Extrinsic Intrinsic Motivation Scale; PWEIMS; Moller, Jager, Williams, & Kao, 2019).  
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57 That paper also reported a consistent pattern of associations between work motivation and  
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3 occupational health. Autonomous work motivation was found to be positively related to six of  
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5 six indicators of physicians' occupational health, while controlled work motivation was  
6  
7 negatively related to three of six.  
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10 This SDT evidence base has led medical researchers and educators to champion the  
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12 value of promoting autonomous motivation in medical education (Kusurkar, 2018; Kusurkar,  
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14 Cate, Asperen, & Croiset, 2011). Several of the primary paths to doing so, as predicted by  
15  
16 SDT, have not yet been tested in a health care setting, and thus represent the primary focus of  
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18 the present research. First, optimizing autonomous motivation and occupational health in  
19  
20 medical practice may involve selecting trainees based on evidence for their endorsing  
21  
22 *intrinsic aspirations* related to pursuing medicine, and supporting those intrinsic aspirations  
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24 throughout training and decades of professional practice. Second, physicians' autonomous  
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26 motivation can be supported by creating conditions in the work environment that support  
27  
28 *psychological need satisfaction*. Next, we will explore the empirical evidence for each  
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30 psychological process, involving aspirations and psychological needs, one at a time.  
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### 35 SDT, intrinsic aspirations & occupational health

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37 Aspirations are defined as long-term, life goals that reflect people's values, and  
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39 working in the SDT tradition, researchers differentiate between intrinsic and extrinsic  
40  
41 aspirations (Grouzet et al., 2005; Sheldon & Kasser, 2008). Intrinsic aspirations reflect the  
42  
43 pursuit of values that are consistent with an innate human orientation towards growth. They  
44  
45 are associated with promoting greater autonomous motivation and eudemonic well-being.  
46  
47 More specifically, SDT researchers have found that intrinsic aspirations tend to fall into three  
48  
49 different intrinsic value domains: self-acceptance, affiliation, and community feeling. By  
50  
51 contrast, extrinsic aspirations reflect the pursuit of values learned from external socializing  
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53 agents. Extrinsic value domains include: money, image, and popularity. A one-year  
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55 longitudinal study of aspiration attainment found that while attaining intrinsic aspirations was  
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positively related to psychological health, attainment of extrinsic aspirations was not.

Surprisingly, attainment of extrinsic aspirations was, in fact, associated with indicators of ill-being (Niemic, Ryan, & Deci, 2009).

Past research suggests that physicians and trainees frequently cite intrinsic aspirations as a central reason for initially pursuing a career in medicine (McManus, Livingston, & Katona, 2006). Furthermore, some have speculated that intrinsic aspirations play an important role in vitalizing physicians and protecting them from burnout (Peabody, 1927; Schwenk, 2018). Over 90 years ago, Peabody (1927) posited that “*the secret of physician well-being is in the caring for the patient.*” In 2018, Schwenk reiterated that hypothesis, and further posited that a root cause of deteriorating physician well-being over the last 60 years has been macro-level factors, especially in the U.S. health care system “that prevent physicians from caring for and entering into deeply satisfying relationships with patients” (p. 1544). To summarize, Schwenk hypothesized that market-driven features of the U.S. healthcare system have over time contributed to decreasing physicians’ commitment to intrinsic aspirations (community feeling) by redirecting their attention toward extrinsic aspirations (wealth), a shift in aspirational focus that has undermined occupational health. A major report on physician burnout by the National Academies of Sciences, Engineering, and Medicine (2019) included a similar assertion that systems-level features of the U.S. healthcare system may conflict with physicians’ values: “*humanism and professionalism are two major motivating factors for most clinicians, and many aspects of the modern work environment conflict with these fundamental ethical norms*” (p. xiv). Humanism and professionalism are motives that underlie the SDT concept of intrinsic aspirations. Unfortunately, few prior studies have empirically investigated these claims about the association between physicians’ aspirations and occupational health.

SDT, psychological needs, work motivation, & occupational health

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2  
3 Self-determination theory identifies three basic psychological needs that must be  
4 supported in order for humans to be optimally healthy, at work or otherwise. These needs are  
5 for autonomy (the need to feel volition and to endorse one's behavior), competence (that one  
6 can achieve our desired outcomes), and relatedness (that one feels warmly and positively  
7 connected to others). In organizational contexts, satisfaction of these basic psychological  
8 needs has been related to positive outcomes for workers functioning and well-being, while  
9 frustration has been found to produce poorer occupational health. For instance, in a recent  
10 meta-analysis of need satisfaction in the workplace, Van den Broeck, Ferris, Chang, and  
11 Rosen (2016) found that satisfaction of the needs for autonomy, competence and relatedness  
12 was positively related to indicators of well-being (i.e., positive affect, engagement, general  
13 well-being, life satisfaction) and inversely related to ill-being (i.e., negative affect, strain,  
14 burnout). Furthermore, for job attitudes, results showed that satisfaction of the three needs  
15 was positively related to job satisfaction and affective commitment, while inversely related to  
16 turnover intentions. For work behavior, the meta-analytic findings showed a positive relation  
17 between satisfaction of each need, performance, and effort, and a negative relation to  
18 deviance. Another recent study by Williams, Halvari, Niemiec, Sørøbø, Olafsen, Westbye  
19 (2014) looked specifically at employees' perceptions of managerial support for basic  
20 psychological needs, finding that managers' support for need satisfaction was associated with  
21 somatic symptom burden, or the experience of physical symptomatology without a medical  
22 explanation. These results go to show the importance of satisfying basic psychological needs  
23 in the work domain both structurally (job design) and interpersonally.

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Several studies have investigated the relations between satisfaction of the basic  
psychological needs and qualities of work motivation (Olafsen & Frølund, 2018; Olafsen &  
Halvari, 2017; Trépanier et al., 2015). Of particular interest is the study by Olafsen, Deci, and  
Halvari (2017), which showed how basic psychological need satisfaction predicted

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3 autonomous work motivation using a model that accounted for reciprocal relations. In turn, in  
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5 industrial and organizational contexts, past research shows how different types of work  
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7 motivation differentially predict workers' depression, anxiety, somatization, intention to leave  
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9 current job, and work performance (Olafsen & Deci, 2020; Williams et al., 2014; Gonzalez et  
10  
11 al., 2014). Hence, the motivational process through basic psychological needs satisfaction and  
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13 quality of work motivation is important to take into account when studying how work  
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15 environment factors relate to workers' functioning and occupational health.  
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19 The most relevant literature to the current study includes a small number of studies  
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21 that have linked intrinsic work aspirations to occupational health, and which found that this  
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23 association could be mediated by psychological need satisfaction and/or autonomous work  
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25 motivation. A series of two studies conducted by Vansteenkiste, Neyrinck, Niemiec, Soenens,  
26  
27 Witte, and Broeck (2007) collected data from two heterogeneous samples of Belgian workers,  
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29 each finding a positive association between valuing intrinsic work aspirations and well-being  
30  
31 at work (job satisfaction) and home (life satisfaction, life happiness). Furthermore, the second  
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33 study found that this association between valuing intrinsic work aspirations and occupational  
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35 health was mediated by the satisfaction of workers' psychological needs for autonomy,  
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37 competence, and relatedness.  
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42 Although no studies have tested the above referenced Vansteenkiste et al. (2007) path  
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44 model using a sample of practicing physicians, two related studies have been conducted using  
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46 samples of other healthcare workers (i.e., with dentists and nurses). A cross-sectional study by  
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48 Montasem, Brown, and Harris (2014) assessed professional aspirations and subjective well-  
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50 being in a sample of 583 dentists in England. The authors found that the perceived importance  
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52 and likelihood of achieving intrinsic aspirations were positively associated with positive  
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54 affect, while perceived likelihood of achieving intrinsic aspirations was also positively related  
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56 to job and life satisfaction. Another key study by Galletta, Portoghese, Pili, Piazza, and  
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Campagna (2016) was conducted with a sample of 304 nurses from an Italian hospital. The authors found that nurses perceived organizational support (relatedness) and job autonomy was positively associated with their occupational health, and that this association was mediated by autonomous motivation. Recently, Hartzband and Groopman (2020) published an NEJM perspective piece speculating about the utility of adopting an SDT-perspective, focused on psychological need satisfaction, to address physician burnout; however, it is noteworthy that none of the SDT literature cited included data collected from physicians.

Based on this literature, we hypothesized that the predicted association between physicians' intrinsic aspirations and occupational health (Hypothesis 1) would be mediated by physicians' basic psychological need satisfaction and autonomous work motivation (Hypothesis 2).

Finally, we collected data on a number of individual physician characteristics we speculated might be associated with occupational health. These included age, gender, and categories of work environment related to ownership (full or partial owner, employee, or contractor). No a priori hypotheses were offered with regard to these individual physician characteristics.

## METHODS

### Ethical review

The study was deemed exempt by the University of Illinois at Chicago Office for the Protection of Research Subjects. The research protocol was seen as involving no more than minimal risk to participants, and although participants could potentially be identified through their demographics, codes linked to identifiers were de-identified (assigned a unique identifying number) and data are only reported in aggregate. Further, any inadvertent disclosure of participants' responses could not reasonably place them at risk of criminal or

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2  
3 civil liability or be damaging to their financial standing, employability, insurability or  
4  
5 reputation.

#### 6 7 Data Sources

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10 A random, national sample of 4,000 practicing physicians, excluding those in  
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12 residency and fellowship training, was selected from the American Medical Association  
13  
14 (AMA) Physician Masterfile, a database that includes virtually every U.S. physician. Paper-  
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16 and-pencil surveys were mailed to potential respondents with a postage paid return envelope.  
17  
18 Data collection was conducted in three waves between October 2014 and May 2015. A \$10  
19  
20 bill was included in the second wave to increase the rate of participation. Respondents were  
21  
22 assured confidentiality and were free to skip any questions. Subsequent to the survey  
23  
24 mailings, 411 physicians were found to be study ineligible [no longer practicing medicine  
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26 (71), no longer at the clinical practice on record (54), or survey was returned as undeliverable  
27  
28 (286)], and were excluded, bringing the sample of eligible invited physicians to 3,589. There  
29  
30 were missing data for a number of variables (see online supplementary Table 1). The final  
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32 CFA is based on a completed-cases analysis (listwise deletion of missing values), resulting in  
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34 a final working sample of 2,116 physicians. The relatively high response rate (59%) may be  
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36 attributed to physicians' concern for their own occupational health and the occupational  
37  
38 health of their colleagues.  
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#### 44 45 Measure Specifications

46  
47 Intrinsic aspirations. Intrinsic aspirations (long-term goals) were assessed using three  
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49 revised items from the Aspiration Index (Kasser, 2002), one item reflecting each of three  
50  
51 intrinsic aspiration categories: meaningful relationships, personal growth, and community  
52  
53 contributions. Participants rated each aspiration for importance (1=very untrue of me; 7 =  
54  
55 very true of me). In each item the word "life" was replaced with the word "work." The  
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57 resulting intrinsic aspiration items were the following: "It is important for me to help others  
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3 improve their lives” (meaningful relationships); “It is important for me that I am able to look  
4  
5 back on my work as being meaningful” (personal growth); “It is important for me to work for  
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7 the betterment of society” (community contributions). The reliability for this measure was  $\alpha =$   
8  
9 .86. See Supplemental Online Table 1.

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12 Need satisfaction at work. Basic psychological need satisfaction at work was assessed  
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14 using a nine-item measure, three items for each of the three needs: autonomy, competence,  
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16 and relatedness, revised to reflect physicians' experiences at work (Deci, Ryan, Gagne, Leone,  
17  
18 Usunoy, & Kornazheva 2001). Statements were rated using a 7-point Likert style scale  
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20 (1=very untrue of me; 7=very true of me). Examples of items include: "I feel I have a great  
21  
22 deal of choice in how I do my work providing patient care" (autonomy,  $\alpha = .68$ ); "I feel  
23  
24 confident in my ability to treat my patients effectively (competence,  $\alpha = .88$ ); "There are not  
25  
26 many people at work whom I am personally close to" (relatedness, reversed,  $\alpha = .71$ ). The  
27  
28 reliability for the composite score of this need satisfaction measure was  $\alpha = .80$ .  
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33 Work motivation. Physician work motivation was assessed using the 8-item revised  
34  
35 Physician Work Extrinsic and Intrinsic Motivation Scale (P-WEIMS; Moller, Jager, Williams,  
36  
37 & Kao, 2019). Statements related to “Why do you do your work providing patient care?”  
38  
39 using a 7-point Likert style scale (1=very untrue of me; 7=very true of me). A composite  
40  
41 measure of autonomous work motivation (characterized by feeling free and volitional;  $\alpha =$   
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43 .84), included intrinsic work regulation (e.g., “Because I derive much pleasure from learning  
44  
45 new things”;  $\alpha = .77$ ) and integrated (e.g., “Because it has become a fundamental part of who  
46  
47 I am”;  $\alpha = .79$ ) work regulation.  
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50  
51 Occupational health. Occupational health indicators that were selected for this study  
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53 were informed by published research identifying decline among U.S. physicians on various  
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55 facets of occupational health and SDT-guided research assessing the relationship between  
56  
57 worker motivation and well-being (Olafson & Deci, in press). The six indicators selected  
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were: general health status, depression risk, burnout (specifically, emotional exhaustion), job satisfaction, intentions to leave current practice, and intentions to leave medicine entirely.

Overall health status was measured using a single item from the 36-item Short Form Health Survey: In general, how would you rate your health? (Brazier et al, 1992). Depression risk was measured using the two-item Patient Health Questionnaire, a validated depression screener that inquires about how frequently an individual has experienced depressed mood and anhedonia over the past two weeks ( $\alpha = .86$ ; Kroenke, Spitzer, & Williams, 2003).

Physician burnout was assessed using a validated single-item measure (Rohland, Kruse, & Rohrer, 2004). This measure of burnout correlates strongly ( $r = .64, p < .0001$ ) with the Maslach Burnout Inventory emotional exhaustion subscale. Another single item measure was used to assess job satisfaction (Friedberg et al., 2004). Separate items were used to assess intent to leave current practice within two years, and intent to leave medicine as a profession within two years (Friedberg et al., 2004).

Respondent characteristics. Age, gender, race, and ethnicity were derived from the AMA Physician Masterfile, with race and ethnicity data populated in the Masterfile using MD Matriculation reports and the GME Census to ACGME-accredited Programs. Participants self-reported the following with regard to their work setting: Are you full or part owner of your main practice? Response categories included: “yes, I am a full or part owner;” “no, I am an employee;” and “no, I am an independent contractor.”

#### Data Analysis

The analyses are based on structural equation modeling (SEM) in Mplus (Muthén & Muthén, 1998-2015) if not otherwise specified. First, confirmatory factor analyses (CFA) were conducted for the measurement scales used. After finding acceptable model fit for the latent variables in the CFA, internal consistency was evaluated by score reliability using SPSS



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3 Statistics 26 (Cronbach, 1951). The CFA tested the psychometric properties of the latent study  
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5 variables (i.e., importance of intrinsic aspirations, need satisfaction, autonomous work  
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7 motivation, depression risk). Given that need satisfaction consists of three dimensions (i.e.,  
8  
9 autonomy, competence, and relatedness) and autonomous work motivation consists of two  
10  
11 dimensions (i.e., integrated regulation, and intrinsic motivation), all assumed to be separate  
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13 constructs, these variables were specified as second-order constructs in the CFA. The fit of  
14  
15 the model was acceptable:  $\chi^2 (df = 159) = 870.07, p < .001, CFI = .94, SRMR = .048,$  and  
16  
17  $RMSEA = .046, 90\% CI (.043, .049)$ . However, the factor loadings of one item for autonomy  
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19 need satisfaction and one item for relatedness need satisfaction was very low ( $< .3$ ); these two  
20  
21 items were also uniquely reverse coded. Thus, a model excluding these items was compared  
22  
23 to the full measurement model. This model showed significantly better fit:  $\chi^2 (df = 124) =$   
24  
25  $594.55, p < .001, CFI = .96, SRMR = .038,$  and  $RMSEA = .042, 90\% CI (.039, .046), S-B$   
26  
27  $\chi^2_{diff} = 304.58 (\Delta df = 35), p < .001$ . Hence, this measurement model was used in the primary  
28  
29 analyses. All first order factor loadings were significant and ranged between .63 and .89. All  
30  
31 second-order factor loadings were significant and ranged between .66 and .90. Supplemental  
32  
33 Online Table 1 summarizes factor loadings from the CFA.

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*Insert Link to Supplemental Online Table 1 about here*

Second, the hypothesized structural paths were added to a modified CFA to test the hypothesized model. Due to the cross-sectional nature of the data, three alternative models were tested in order to verify the order of variables. In these alternative models the order of the variables was changed to compare the fit of the hypothesized model to that of the three alternative models which were created based on theoretical and/or statistical considerations. Furthermore, because research has highlighted the importance of distinguishing between the basic psychological needs (Van den Broeck et al., 2016), an additional model where each need was separately accounted for was tested in addition to the more parsimonious



hypothesized model. In addition to the hypothesized relations, the structural models that included gender, age, and work setting were added as covariates given that these showed significant correlations with several of the occupational health outcome variables.

Because the data showed multivariate non-normality, the Satorra-Bentler scaled  $\chi^2$  and robust standard errors adjustment to the maximum likelihood estimator was used. Given the nature of the reported measurements, the structural models consisted of both latent and observed variables. Model fit for all models was evaluated with the  $\chi^2$  and its degrees of freedom (*df*), the root mean square error of approximation (RMSEA) and its confidence interval (CI), the standardized root mean square residual (SRMR) and the comparative fit index (CFI). Acceptable fit indices are between 0.05 and 0.08 for the RMSEA and SRMR (Hu & Bentler, 1999). Values above 0.95 for the CFI are generally recommended for good-fitting models (Hu & Bentler, 1999), although values over 0.90 are seen as acceptable (Hoyle, 1995).

## RESULTS

### Sample Characteristics

The mean age of physicians in the sample was 52.3 years (SD = 11.3); 68% of respondents were male; 56% were White, 15% Asian, 5% Hispanic or Latino, 4% Black or African American, 2% other, and 19% were listed as “unknown.” Compared to non-respondents, non-white physicians responded less frequently than white physicians but no other differences were observed. See Supplementary Online Table 2.

*Insert link to Supplemental Online Table 2 about here*

### Preliminary Analyses

Supplemental Online Table 3 summarizes zero-order correlations between variables included in our models. As predicted, the pattern of correlations revealed a consistent positive association between intrinsic aspirations and occupational health.

*Insert link to Supplemental Online Table 3 about here*

### Primary Analyses

The hypothesized model. The fit of the hypothesized model was satisfactory:  $\chi^2 (df = 292) = 1492.28, p < .001, CFI = .93, SRMR = .052, \text{ and } RMSEA = .044, 90\% \text{ CI } (.042, .046).$

The paths coefficients displayed in Figure 1 showed that importance of intrinsic aspirations ( $\beta = .76, p < .001$ ) were significantly positively related to need satisfaction, and need satisfaction was significant positively related to autonomous work motivation ( $\beta = .77, p < .001$ ).

Furthermore, autonomous work motivation was significantly negatively related to depression risk, intention to leave practice, intention to leave medicine, perceived ill health, and burnout, while significantly positively related to satisfaction with work.

Covariates. As for the individual characteristics, gender was significantly related to depression risk such that women were at greater risk, yet gender was also significantly related to intention to leave practice such that women were less likely to report intentions to leave their practices. Age was significantly positively related to intention to leave practice, intention to leave medicine, perceived ill health. and significant negatively related to burnout. Lastly, being an independent contractor was significantly positively related to depression risk.

*Insert Figure 1 about here*

Alternative models. To test the placement of intrinsic aspirations, we ran three models where the order of intrinsic aspirations, need satisfaction, and autonomous work motivation were altered. In the first model, basic psychological need satisfaction was specified to predict intrinsic aspirations. Intrinsic aspirations predicted autonomous motivation, which, in turn, predicted the outcome variables. This model did not show a better fit than the hypothesized model:  $\chi^2 (df = 292) = 1497.931, p < .001, CFI = .93, SRMR = .059, \text{ and } RMSEA = .044, 90\% \text{ CI } (.042, .046).$  In the second model, basic psychological need satisfaction was specified to predict autonomous motivation, autonomous motivation predicted intrinsic aspiration, which, in turn, predicted the outcome variables. This model did not show a better fit than the

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3 hypothesized model:  $\chi^2 (df = 292) = 1602.746, p < .001, CFI = .93, SRMR = .063,$  and  
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5 RMSEA = .046, 90% CI (.044, .048). In the third alternative model, need satisfaction was  
6  
7 specified to predict both work motivation and intrinsic aspirations, which in turn predicted the  
8  
9 outcome variable. This model did show a decrease in  $\chi^2$  compared to the hypothesized model:  
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11  $\chi^2 (df = 286) = 1479.423, p < .001, CFI = .93, SRMR = .053,$  and RMSEA = .044, 90% CI  
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13 (.042, .047), but this decrease was not a significant improvement of fit: S-B  $\chi^2_{diff} = 11.31 (\Delta df$   
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15  $= 6), p > .05.$

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19 Indirect relations in the hypothesized model. The results showed that valuing intrinsic  
20  
21 aspirations was indirectly related to autonomous work motivation through need satisfaction.  
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23 Furthermore, need satisfaction was indirectly related to satisfaction with work, intention to  
24  
25 leave practice, intention to leave medicine, depression risk, perceived ill health, and burnout.  
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29 The hypothesized model with separate needs. To test the significance of each basic  
30  
31 psychological need, an additional model where the three needs were separated was tested.  
32  
33 This model showed acceptable fit to the data:  $\chi^2 (df = 291) = 1931.997, p < .001, CFI = .91,$   
34  
35 SRMR = .060, and RMSEA = .052, 90% CI (.049, .054). The path coefficients showed that  
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37 intrinsic aspirations was significantly and positively related to autonomy need satisfaction,  
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39 competence need satisfaction, and relatedness need satisfaction. Autonomy need satisfaction,  
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41 competence need satisfaction, and relatedness need satisfaction were significantly positively  
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43 related to autonomous work motivation. Furthermore, autonomous work motivation was  
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45 significantly related to all six indicators of occupational health in the predicted directions. See  
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47 Figure 2.  
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52 *Insert Figure 2 about here*

## 53 DISCUSSION

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56 The importance of intrinsic aspirations for physicians' occupational health was long  
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58 hypothesized (Peabody, 1927; Schwenk, 2018), but under researched. This study  
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conceptualized physicians' intrinsic aspirations and psychological need satisfaction at work as antecedents of physicians' autonomous work motivation and occupational health. Study results showed that physicians' intrinsic aspirations related positively to their basic psychological need satisfaction and, in turn, to their autonomous work motivation. Furthermore, physicians' autonomous work motivation related positively to their work-related well-being (i.e., job satisfaction) and negatively to their work-related ill-being (i.e., depression risk, perceived ill-health, burnout, intentions to leave current practice, and intentions to leave medicine entirely). This empirically-supported model underscores the importance of motivational process for understanding physicians' declining occupational health.

Specifically, the present findings support an SDT-informed model that highlights two antecedents of physicians' autonomous work motivation and occupational health, intrinsic aspirations and need satisfaction (Hope, Holding, Verner-Filion, Sheldon, & Koestner, 2019), finding support within a large sample of working U.S. physicians. While SDT-guided research on occupational health has tended to focus more on the importance of need satisfaction (Van den Broeck et al., 2016), the consideration of intrinsic aspiration has been less well studied. Insights from this model can be leveraged to design more effective physician-health interventions, targeting and treating root causes, as opposed to late-stage symptoms, and considering factors that operate at both individual- and systems-levels. We found support for our hypothesis that valuing intrinsic work aspirations has a cascading, positive impact on physicians' psychological need satisfaction, autonomous motivation, and health.

### Implications

Some readers may find these findings unsurprising, or fail to appreciate the practical implications. After all, physicians already endorse intrinsic aspirations as a modal reason for pursuing medical training, and medical schools already value intrinsic aspirations as a selection

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3 criterion. Furthermore, physicians have been writing anecdotal accounts and postulating about  
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5 the vitalizing potency of intrinsic aspirations for decades (Peabody, 1927; Rosenthal &  
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7 Verghese, 2016; Schwenk, 2018). We argue that empirically measuring and documenting  
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9 these associations in this study was a critical step toward developing more effective  
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11 interventions because it helps justify future long-term investment required to target and treat  
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13 these root causes. This approach is in line with the recent National Academies (2019) report  
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15 on physician burnout, recommending large-scale, especially systems-level, changes to  
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17 mitigate clinician burnout and promote well-being, all of which will require major  
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19 investments of resources.  
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24 It may also be illustrative to consider our findings in relation to the historic Covid-19  
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26 pandemic that is currently straining physicians in the U.S. and around the world to a degree  
27  
28 and duration unmatched in the last century. As argued in the Introduction, the occupational  
29  
30 health of physicians in the U.S. was poor before the Covid-19 pandemic. Numerous indicators  
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32 suggest the Covid-19 pandemic has made matters far worse, in the U.S. and globally  
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34 (Amanullah & Shankar, 2020). A question many physicians are now confronting is whether  
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36 sacrificing their health, even their very lives, for their occupation is worth it. We believe the  
37  
38 affirmative answer to this question is far more likely when a physician's intrinsic aspirations  
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40 are strong and strongly supported by their work culture, and far less likely when extrinsic  
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42 aspirations become foundations for work motivation. Another unfortunate feature of the  
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44 Covid-19 pandemic, especially in the U.S., has been the loss of employer-sponsored health  
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46 insurance, as millions of Americans became unemployed. As a result, many physicians in the  
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48 U.S. have faced patients who can no longer afford to receive their care. This dynamic, we  
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50 believe, puts U.S. physicians in a uniquely gut-wrenching position, one that was experienced  
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52 pre-pandemic, but now on a far larger scale. Our findings speak to the reasons this dynamic  
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54 undermines physicians' motivation and well-being. Namely, it thwarts intrinsic aspirations  
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3 and physicians' basic psychological need for relatedness, i.e., to feel meaningfully connected  
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5 with patients.  
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### 7 Future Research Directions

10 While some may question whether it's possible to increase the intrinsic aspirations of  
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12 medical students and practicing physicians, this is an important, empirically testable question.  
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14 Future interventions should target intrinsic aspirations and need satisfaction in a range of  
15  
16 different ways, at both the individual- and systems-levels. Individual-level interventions  
17  
18 might strive to better select for and sustain intrinsic aspirations through years of training and  
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20 practice (Kusurkar, 2018; Kusurkar et al., 2011), such as by setting aside protected time for  
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22 meaningful work and by funding those initiatives (e.g., a hospital might fund physicians' time  
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24 to volunteer with organizations like the MAVEN Project, Volunteers in Medicine, or Doctors  
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26 Without Borders). Consistent with this, Linzer and colleagues (2014, p. 19) proposed  
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28 "protected time for meaningful activities," to prevent physician burnout, specifically, "at least  
29  
30 one-half day per week for clinicians to do what they are most passionate about." Another  
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32 individual-level intervention that has been empirically shown to increase intrinsic aspirations  
33  
34 in the general population involves encouraging deep reflection on mortality (Grant & Wade-  
35  
36 Benzoni, 2009; Prentice, Kasser, & Sheldon, 2018). Although prior research has found that  
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38 physicians tend to become more comfortable with patients' mortality over time (Dickinson &  
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40 Tournier, 1994), few studies have explored physicians' thoughts about their own mortality, or  
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42 the implications of this for physicians' aspirations and occupational health.  
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48 Because intrinsic aspirations are positively predictive of psychological need  
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50 satisfaction, the interventions described above should also result in greater downstream need  
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52 satisfaction. That said, multi-level interventions could also directly target psychological  
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54 needs. For example, future interventions can directly support physicians' autonomy by  
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56 increasing flexibility and respecting physicians' ability to make clinical judgments about  
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3 patient care. A recent meta-analysis of interventions to reduce physician burnout found that  
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5 giving doctors more flexibility in their schedules and increasing their participation in decision  
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7 making were associated with reduced burnout (Panagioti et al., 2017). A recent intervention  
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9 by Locke et al. (2020) found that giving faculty at an academic medical center an anonymous  
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11 feedback tool improved their well-being. Competence could be directly supported by  
12  
13 providing physicians with more focused, informational feedback on their performance for the  
14  
15 purpose of increasing mastery, and by presenting physicians with opportunities for optimally  
16  
17 challenging work (e.g., inviting their input on hard-to-diagnose cases). Finally, relatedness  
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19 could be directly supported with consideration of both interprofessional care team interactions  
20  
21 and interactions with patients (e.g., by training and promoting narrative medicine and  
22  
23 sensitive interviewing skills). As the Covid-19 pandemic has accelerated a shift from in-  
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25 person practice to telemedicine, researchers should also consider how the affordances of  
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27 telemedicine platforms either support or thwart physicians' psychological need satisfaction.  
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34 Future research and interventions to increase and maintain physicians' intrinsic  
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36 aspirations and need satisfaction should also focus on what the National Academies Report  
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38 (2019) called the *systems-level*, by targeting the structure, organization, and culture of health  
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40 care. Across U.S. healthcare organizations there is variability in terms of how compensation  
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42 models emphasize intrinsic relative to extrinsic aspirations. For example, the Cleveland Clinic  
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44 and Kaiser Permanente have shifted toward paying physicians salaries, and away from  
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46 incentives for volume of services performed (i.e., fee-for-service; Hayes, Noseworthy, &  
47  
48 Farrugia, 2020), a model that may support intrinsic aspirations to a greater extent by  
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50 deemphasizing financial incentives. Consistent with this, the National Academies (2019, p.  
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52 10) report broadly recommended that organizations "align incentives, compensation, and  
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54 reward systems for clinicians and work units with organizational and professional values."  
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3 On an even broader level, Schwenk (2018) hypothesized that “the current [U.S. health  
4 care] system is the consequence of the (mistaken) belief that health care is most appropriately  
5 managed like other parts of the US economy, as a market-driven, competitive enterprise” (p.  
6 1544). Schwenk argued that the current market-driven U.S. healthcare system is the root  
7 cause of physicians’ declining occupational health. National policy makers in the U.S. are  
8 actively debating systemwide changes consistent with those proposed by Schwenk (2018),  
9 e.g., proposals for Medicare-for-all and Public Plans (Neuman, Pollitz, & Tolbert, 2018). If  
10 and when these major, systemwide policy changes materialize, we believe researchers should  
11 be measuring whether there are associated downstream changes in physicians’ intrinsic  
12 aspirations, need satisfaction, work motivation, and occupational health.  
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### 26 Limitations

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28 One limitation of this study concerns the use of abridged scales to assess physicians’  
29 perceived importance of intrinsic aspirations, psychological need satisfaction at work, and  
30 occupational health. This limitation was accepted as a trade-off during the study design phase,  
31 out of consideration for physicians’ limited and costly time and a desire to maximize response  
32 rate and representativeness of sample. However, follow up studies should consider using the  
33 more comprehensive 105-item Aspiration Index (Kasser, 2002) and the expanded 24-item  
34 Basic Psychological Need Satisfaction and Frustration Scale (BPNSFS; Chen et al., 2015).  
35 This would make using more nuanced, latent profiling methods possible (Bradshaw, Sahdra,  
36 Ciarrochi, Parker, Martos, & Ryan, 2019). Similarly, although the pattern of results was  
37 relatively consistent across all six short-form indicators of occupational health, longer-form  
38 measures of each indicator would be better.  
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54 Another limitation to the present research is the cross-sectional design. As such, an  
55 important direction for future research involves funding significantly more costly longitudinal  
56 observational studies and experimental (i.e., RCT) tests of interventions designed to promote  
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3 physicians' intrinsic aspirations and measure downstream consequences. That said, prior  
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5 longitudinal research has supported the proposed directionality of the link between work  
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7 motivation and occupational health (Dagenais-Desmarais, Leclerc, & Londei-Shortall, 2018).  
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10 Finally, it is important to recognize that physicians' aspirations, need satisfaction, and  
11  
12 autonomous motivation are not the only factors important to physicians' occupational health.  
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14 These motivation-related factors are primarily concerned with prevention. The National  
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16 Academies (2019) report on physician burnout provides a more comprehensive review of  
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18 causes and treatments, including the burden of tedious tasks and the use of technology to  
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20 reduce burdens and redundancies. Their report also points to reducing stigma for clinicians  
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22 seeking help, and making assistance more accessible.  
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## 26 Conclusion

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28 This research provides empirical support for the hypothesis that dedication to intrinsic  
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30 work aspirations (i.e., long-term goals tied to valuing meaningful relationships, personal  
31  
32 growth, and community contributions) can help protect physicians from experiencing poor  
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34 occupational health. Further, we found that the positive association between intrinsic  
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36 aspirations and occupational health was mediated by need satisfaction and autonomous  
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38 motivation. We hope these findings can help guide health services researchers, policymakers,  
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40 managers, and practitioners to promote physicians' health, and ultimately patient (population)  
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42 health, as well.  
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46  
47

## 48 REFERENCES

49  
50  
51  
52 Amanullah, S., & Shankar, R.R. (2020). The Impact of COVID-19 on Physician Burnout

53 Globally: A Review. *Healthcare*, 8. <https://doi.org/10.3390/healthcare8040421>

54  
55  
56  
57 Bradshaw, E. L., Sahdra, B. K., Ciarrochi, J., Parker, P., Martos, T., & Ryan, R. (2019). A

58  
59 configural approach to aspirations: The social breadth of aspiration profiles predicts  
60

well-being over and above the intrinsic and extrinsic aspirations that comprise the profiles. <https://doi.org/10.31234/osf.io/srb75>

Brazier, J. E., Harper, R., Jones, N. M., O’Cathain, A., Thomas, K. J., Usherwood, T., & Westlake, L. (1992). Validating the SF-36 health survey questionnaire: New outcome measure for primary care. *BMJ Clinical Research Education*, *305*, 160–164.

Chen, X., Ran, L., Zhang, Y., Yang, J., Yao, H., Zhu, S., & Tan, X. (2019). Moderating role of job satisfaction on turnover intention and burnout among workers in primary care institutions: A cross-sectional study. *BMC Public Health*, *19*, 1526.

Chen, B., Vansteenkiste, M., Beyers, W., Boone, L., Deci, E. L., Van der Kaap-Deeder, J., . . . & Verstuyf, J. (2015). Basic psychological need satisfaction, need frustration, and need strength across four cultures. *Motivation and Emotion*, *39*, 216–236.

Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, *16*, 297–334.

Dagenais-Desmarais, V., Leclerc, J.-S., & Londei-Shortall, J. (2018). The relationship between employee motivation and psychological health at work: A chicken-and-egg situation? *Work & Stress*, *32*, 147–167.

Deci, E. L., & Ryan, R. M. (2000). The "what" and "why" of goal pursuits: Human needs and the self-determination of behavior. *Psychological Inquiry*, *11*, 227-268.

Deci, E. L., Ryan, R. M., Gagné, M., Leone, D. R., Usunov, J., & Kornazheva, B. P. (2001). Need satisfaction, motivation, and well-being in the work organizations of a former eastern bloc country: A cross-cultural study of self-determination. *Personality and Social Psychology Bulletin*, *27*, 930–942.

Dewa, C. S., Loong, D., Bonato, S., & Trojanowski, L. (2017). The relationship between physician burnout and quality of healthcare in terms of safety and acceptability: A systematic review. *British Medical Journal Open*, *7*, e015141.

- 1  
2  
3 Dickinson, G. E., & Tournier, R. E. (1994). A decade beyond medical school: A longitudinal  
4 study of physicians' attitudes toward death and terminally-ill patients. *Social Science*  
5 & *Medicine*, 38, 1397–1400.  
6  
7  
8  
9  
10 Dyrbye, L. N., Varkey, P., Boone, S. L., Satele, D. V., Sloan, J. A., & Shanafelt, T. D. (2013).  
11 Physician satisfaction and burnout at different career stages. *Mayo Clinic Proceedings*,  
12 88, 1358–1367.  
13  
14  
15  
16  
17 Friedberg, M. W., Chen, P. G., Van Busum, K. R., Aunon, F., Pham, C., Caloyeras, J.,  
18 Mattke, S., Pitchforth, E., Quigley, D. D., Brook, R. H., Crosson, F. J., & Tutty, M.  
19 (2013). *Factors Affecting Physician Professional Satisfaction and Their Implications*  
20 *for Patient Care, Health Systems, and Health Policy*, RAND, RR439.  
21  
22  
23  
24  
25  
26 Galletta, M., Portoghese, I., Pili, S., Piazza, M. F., & Campagna, M. (2016). The effect of  
27 work motivation on a sample of nurses in an Italian healthcare setting. *Work*, 54, 451–  
28 460.  
29  
30  
31  
32  
33 Gonzalez, M. G., Swanson, D.P., Lynch, M., Williams, G.C. (2014). Testing satisfaction of  
34 basic psychological needs as a mediator of the relationship between socioeconomic  
35 status and physical and mental health. *Journal of Health Psychology*, 21, 972-982.  
36  
37  
38  
39  
40 Grant, A. M., & Wade-Benzoni, K. A. (2009). The hot and cool of death awareness at work:  
41 Mortality cues, aging, and self-protective and prosocial motivations. *Academy of*  
42 *Management Review*, 34, 600–622.  
43  
44  
45  
46  
47 Hartzband, P., & Groopman, J. (2020). Physician Burnout, Interrupted. *New England Journal*  
48 *of Medicine*, 382(26), 2485–2487.  
49  
50  
51  
52  
53  
54 Hayes, S. N., Noseworthy, J. H., & Farrugia, G. (2020). A structured compensation plan  
55 results in equitable physician compensation: A single-center analysis. *Mayo Clinic*  
56 *Proceedings*, 95, 35–43.  
57  
58  
59  
60

- 1  
2  
3 Hope, N. H., Holding, A. C., Verner-Filion, J., Sheldon, K. M., & Koestner, R. (2019). The  
4 path from intrinsic aspirations to subjective well-being is mediated by changes in basic  
5 psychological need satisfaction and autonomous motivation: A large prospective test.  
6  
7  
8  
9  
10 *Motivation and Emotion, 43*, 232–241.
- 11  
12 Hoyle, R. H. (Ed.). (1995). Structural equation modeling: Concepts, issues, and applications.  
13  
14 Thousand Oaks, CA, US: Sage Publications, Inc.
- 15  
16  
17 Hu, L.-t., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure  
18 analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling,*  
19  
20  
21  
22 6, 1-55.
- 23  
24 Kasser, T. (2002). Sketches for a self-determination theory of values. In E. L. Deci, & R. M.  
25  
26  
27  
28  
29 Ryan (Eds.), *Handbook of self-determination research*. Rochester, NY: University of  
30  
31  
32  
33  
34  
35  
36  
37  
38  
39 Rochester Press.
- 40  
41  
42 Krasner, M. S., Epstein, R. M., Beckman, H., Suchman, A. L., Chapman, B., Mooney, C. J.,  
43  
44  
45  
46  
47  
48 & Quill, T. E. (2009). Association of an educational program in mindful  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60 communication with burnout, empathy, and attitudes among primary care physicians.  
*Journal of the American Medical Association, 302*, 1284-1293.
- 40  
41  
42 Kroenke, K., Spitzer, R. L., & Williams, J. B. W. (2003). The Patient Health Questionnaire-2:  
43  
44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60 Validity of a two-item depression screener. *Medical Care, 41*, 1284–1292.
- 44  
45  
46  
47  
48  
49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60 Kusurkar, R. A. (2018). Autonomous motivation in medical education. *Medical Teacher, 41*,  
1083-1084.
- 49  
50  
51  
52  
53  
54  
55  
56  
57  
58  
59  
60 Kusurkar, R. A., Cate, T. J. T., Asperen, M. van, & Croiset, G. (2011). Motivation as an  
independent and a dependent variable in medical education: A review of the literature.  
*Medical Teacher, 33*, 242-262.

- 1  
2  
3 Linzer, M., Levine, R., Meltzer, D., Poplau, S., Warde, C., & West, C. P. (2014). 10 Bold  
4  
5 Steps to Prevent Burnout in General Internal Medicine. *Journal of General Internal*  
6  
7 *Medicine, 29*, 18–20.  
8  
9
- 10 Locke, A. B., Fortenberry, K. T., Sullivan, E., Ose, D., Tingey, B., Qeadan, F., Henson, A., &  
11  
12 Hala, S. V. (2020). Use of a feedback survey as a part of a wellness champions  
13  
14 program to improve academic faculty satisfaction and burnout: Implications for  
15  
16 burnout in academic health centers: *Global Advances in Health and Medicine*.  
17  
18
- 19 Mata, D. A., Ramos, M. A., Bansal, N., Khan, R., Guille, C., Di Angelantonio, E., & Sen, S.  
20  
21 (2015). Prevalence of depression and depressive symptoms among resident  
22  
23 physicians: A systematic review and meta-analysis. *Journal of the Medical*  
24  
25 *Association, 314*, 2373–2383.  
26  
27
- 28 McManus, I., Livingston, G., & Katona, C. (2006). The attractions of medicine: The generic  
29  
30 motivations of medical school applicants in relation to demography, personality and  
31  
32 achievement. *BMC Medical Education, 6*, 11.  
33  
34
- 35 Moller, A. C., Jager, A. J., Williams, G. C., & Kao, A. C. (2019). U.S. physicians' work  
36  
37 motivation and their occupational health: A national survey of practicing physicians.  
38  
39 *Medical Care, 57*, 334-340.  
40  
41
- 42 Montasem, A., Brown, S. L., & Harris, R. (2014). Subjective well-being in dentists: The role  
43  
44 of intrinsic aspirations. *Community Dentistry and Oral Epidemiology, 42*, 279–288.  
45  
46
- 47 Muthén, L. K., & Muthén, B. O. (1998-2012). Mplus user's guide: Statistical analysis with  
48  
49 latent variables (7th ed.). Los Angeles, CA: Muthén & Muthén.  
50  
51
- 52 National Academies of Sciences, Engineering, and Medicine. (2019). *Taking action against*  
53  
54 *clinician burnout: a systems approach to professional well-being*. National Academies  
55  
56 Press.  
57  
58  
59  
60

- 1  
2  
3 Niemiec, C. P., Ryan, R. M., & Deci, E. L. (2009). The path taken: Consequences of attaining  
4  
5 intrinsic and extrinsic aspirations in post-college life. *Journal of Research in*  
6  
7 *Personality*, 43, 291–306.  
8  
9  
10 Noseworthy, J., Madara, J., Cosgrove, D., Edgeworth, M., Ellison, E., Krevans, S., ...  
11  
12 Harrison, D. (2017, March 28). Physician burnout is a public health crisis: A Message  
13  
14 to our fellow health care CEOs. *Health Affairs Blog*.  
15  
16  
17 Neuman, T., Pollitz, K., & Tolbert, J. (2018). *Medicare-for-All and Public Plan Buy-In*  
18  
19 *proposals: Overview and key issues*. Kaiser Family Foundation.  
20  
21  
22 Olafsen, A. H. & Deci, E. L. (2020). Self-determination theory and its relation to  
23  
24 organizations. *Oxford research encyclopedia of psychology*. Oxford: Oxford  
25  
26 University Press.  
27  
28  
29 Olafsen, A. H., Deci, E. L., & Halvari, H. (2017). Basic psychological needs and work  
30  
31 motivation: A longitudinal test of directionality. *Motivation and Emotion*, 42, 178-  
32  
33 189.  
34  
35  
36 Olafsen, A. H., & Frølund, C. W. (2018). Challenge accepted! Distinguishing between  
37  
38 challenge- and hindrance demands. *Journal of Managerial Psychology*, 33, 345-357.  
39  
40  
41 Olafsen, A. H., & Halvari, H. (2017). Motivational mechanisms in the relation between job  
42  
43 characteristics and employee functioning. *The Spanish Journal of Psychology*, 20.  
44  
45  
46 Panagioti, M., Panagopoulou, E., Bower, P., Lewith, G., Kontopantelis, E., Chew-Graham,  
47  
48 C., Dawson, S., Marwijk, H. van, Geraghty, K., & Esmail, A. (2017). Controlled  
49  
50 Interventions to Reduce Burnout in Physicians: A Systematic Review and Meta-  
51  
52 analysis. *JAMA Internal Medicine*, 177, 195–205.  
53  
54  
55 Peabody FW. (1927). The care of the patient. *Journal of the American Medical Association*.  
56  
57 88, 877-882.  
58  
59  
60

- 1  
2  
3 Prentice, M., Kasser, T., & Sheldon, K. M. (2018). Openness to experience predicts intrinsic  
4 value shifts after deliberating one's own death. *Death studies*, 42(4), 205-215.  
5  
6  
7 Rathert, C., Williams, E. S., & Linhart, H. (2018). Evidence for the quadruple aim: A  
8 systematic review of the literature on physician burnout and patient outcomes.  
9  
10  
11  
12 *Medical Care*, 56, 976-984.  
13  
14 Rittenhouse DR, Mertz E, Keane D, & Grumbach K. (2004). No exit: An evaluation of  
15 measures of physician attrition. *Health Services Research*, 39,1571-1588.  
16  
17  
18 Rohland, B. M., Kruse, G. R., & Rohrer, J. E. (2004). Validation of a single-item measure of  
19 burnout against the Maslach Burnout Inventory among physicians. *Stress and Health*,  
20  
21  
22  
23  
24  
25  
26  
27  
28  
29  
30  
31 Rotenstein, L. S., Ramos, M. A., Torre, M., Segal, J. B., Peluso, M. J., Guille, C., ... Mata, D.  
32  
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56  
57  
58  
59  
60
- A. (2016). Prevalence of depression, depressive symptoms, and suicidal ideation among medical students: A systematic review and meta-analysis. *Journal of the American Medical Association*, 316, 2214–2236.
- Rotenstein, L. S., Torre, M., Ramos, M. A., Rosales, R. C., Guille, C., Sen, S., & Mata, D. A. (2018). Prevalence of burnout among physicians: A systematic review. *Journal of the American Medical Association*, 320, 1131–1150.
- Ryan, R. M., & Deci, E. L. (2017). *Self-determination theory: Autonomy and basic psychological needs in human motivation, social development, and wellness*. New York: Guilford.
- Schwenk, T.L. (2018). Physician well-being and the regenerative power of caring. *Journal of the American Medical Association*, 319, 1543-1544.



Schwenk T.L., & Gold, K.J. (2018). Physician burnout—A serious symptom, but of what?

*Journal of the American Medical Association*, 320, 1109-1110.

Shanafelt, T., Goh, J., & Sinsky, C. (2017). The business case for investing in physician well-

being. *Journal of the American Medical Association: Internal Medicine*, 177, 1826–1832.

Shanafelt, T. D., Hasan, O., Dyrbye, L. N., Sinsky, C., Satele, D., Sloan, J., & West, C. P.

(2015). Changes in burnout and satisfaction with work-life balance in physicians and the general U.S. working population between 2011 and 2014. *Mayo Clinic Proceedings*, 90, 1600–1613.

Shanafelt, T. D., West, C. P., Sinsky, C., Trockel, M., Tutty, M., Satele, D. V., . . . Dyrbye, L.

N. (2019). Changes in burnout and satisfaction with work-life integration in physicians and the general US working population between 2011 and 2017. *Mayo Clinic Proceedings*, 94, 1681-1694.

The Lancet. (2019). Physician burnout: A global crisis. *The Lancet*, 394(10193), 93.

Thomas, L. R., Ripp, J. A., & West, C. P. (2018). Charter on physician well-being. *Journal of*

*the American Medical Association*, 319, 1541-1542.

Trépanier, S. G., Forest, J., Fernet, C., & Austin, S. (2015). On the psychological and

motivational processes linking job characteristics to employee functioning: Insights from self-determination theory. *Work and Stress*, 29, 286-305.

Van den Broeck, A., Ferris, D. L., Chang, C.-H., & Rosen, C. C. (2016). A review of self-

determination theory's basic psychological needs at work. *Journal of Management*, 42, 1195–1229.

Williams, G. C., Halvari, H., Niemiec, C. P., Sørøbø, Ø., Olafsen, A. H., & Westbye, C.

(2014). Managerial support for basic psychological needs, somatic symptom burden



and work-related correlates: A self-determination theory perspective. *Work and Stress*,  
28, 404-419.

Williams, E. S., Rathert, C., & Buttigieg, S. C. (2020). The personal and professional  
consequences of physician burnout: A systematic review of the literature. *Medical  
Care Research and Review*, 77, 371-386.

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Figure 1

Structural Equation Model with Composite Psychological Need Satisfaction as Mediator

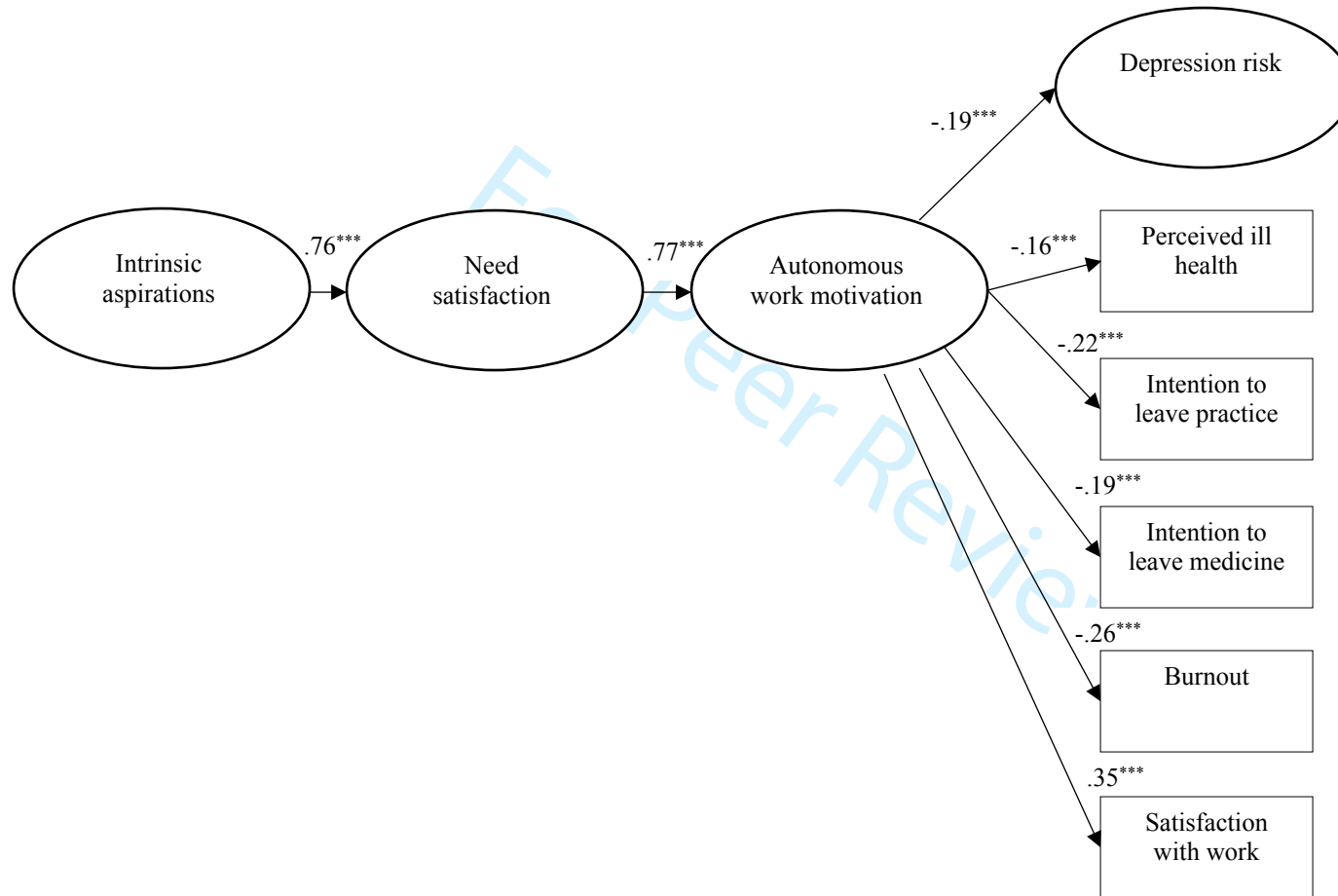
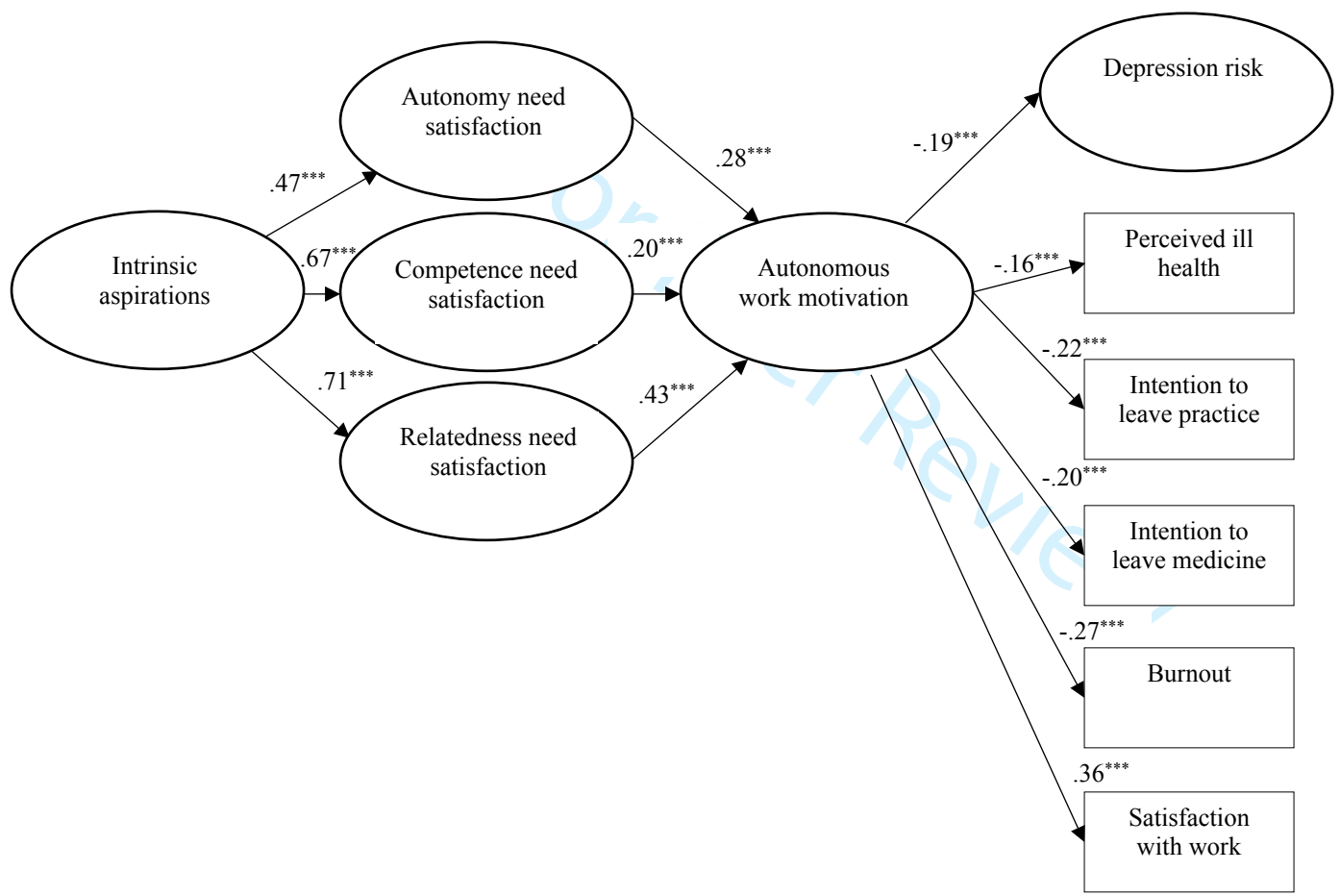


Figure 2

Structural Equation Model with Satisfaction of Three Psychological Needs as Independent Mediators



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3 **Supplemental online material: Table 1**

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5 Results from the confirmatory factor analysis of the final measurement model

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Variable/item	M	Variance	FL	FL/S.E.
<b>Intrinsic aspirations (N=2,247)</b>				
It is important for me to work for the betterment of society	5.77	1.68	.77	51.502
It is important for me that I am able to look back on my work as being meaningful	6.19	1.06	.85	59.134
It is important for me to help others improve their lives	6.22	0.88	.86	61.792
<b>Autonomy need satisfaction (N=2,256)</b>				
I feel I have a great deal of choice in how I do my work providing patient care	4.77	2.99	.67	34.290
I am free to express my ideas and opinions at work	5.57	2.13	.78	36.528
I feel pressure at work	-	-	-	-
<b>Competence need satisfaction (N=2,255)</b>				
I feel confident in my ability to treat my patients effectively	6.28	0.70	.81	46.173
I have the ability to help my patients with their medical problems	6.31	0.63	.89	49.490
I have the knowledge and skills necessary to help my patients stay as healthy as possible	6.26	0.69	.80	40.962
<b>Relatedness need satisfaction (N=2,255)</b>				
My patients respect me as a physician	6.10	0.95	.76	36.729
My physician colleagues respect me as a professional	6.13	0.84	.71	27.543
There are not many people at work whom I am personally close to	-	-	-	-
<b>Composite Need satisfaction (N=2,255)</b>				
Autonomy need satisfaction	-	-	.66	27.768
Competence need satisfaction	-	-	.90	40.888
Relatedness need satisfaction	-	-	.77	29.625
<b>Integrated regulation (N=2,242)</b>				
Because it has become a fundamental part of who I am	5.81	1.30	.81	57.461
Because it is part of the way in which I have chosen to live my life	5.59	1.11	.63	28.819
Because this work is a part of my life	5.73	1.17	.82	51.493
<b>Intrinsic motivation (N=2,244)</b>				
Because I derive much pleasure from learning new things	5.84	0.99	.74	37.535
For the satisfaction I experience from taking on interesting challenges	5.79	1.11	.79	42.959
For the satisfaction I experience when I am successful at doing difficult tasks	5.62	1.31	.66	32.183
<b>Autonomous motivation (N=2,240)</b>				
Integrated regulation	-	-	.85	44.717
Intrinsic motivation	-	-	.89	46.804
<b>Depression risk (N=2,231)</b>				
Little interest or pleasure in doing things	1.37	0.45	.88	23.024

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Feeling down, depressed or hopeless	1.33	0.38	.86	22.795
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Note. M = Mean; FL = Factor loading; S.E = Standard error. Perceived ill health (N=2,245), intention to leave practice (N=2,242), intention to leave medicine (N=2,244), burnout (N=2,239), and satisfaction with work (N=2,235) were each assessed using single items.

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4 **Supplemental online material: Table 2**

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6 *Characteristics of Physicians who Received a Mail Survey: Respondents and Non-respondents*

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	AMA Physician Masterfile (N=755,774)	Overall Sample (N=3589)	Non- Respondents (n=1473)	Respondents (n=2116)	<i>p</i> -value
	N (%)	N (%)	N (%)	N (%)	( $\chi^2$ )
<b>Age,</b> Years, Mean (SD)	51.6 (11.7)	52.3 (11.3)	52.3 (11.5)	52.3 (11.1)	.526 <sup>a</sup>
<b>Gender</b>					.299
Female	246,559 (33)	1142 (32)	457 (31)	679 (32)	
Male	509,215 (67)	2447 (68)	1016 (69)	1437 (68)	
<b>Race/Ethnicity</b>					<.001
Asian	107,679 (14)	490 (14)	221 (15)	275 (13)	
Black/African American	31,276 (4)	138 (4)	74 (5)	68 (3)	
Hispanic or Latino	41,562 (5)	193 (5)	88 (6)	111 (5)	
White	408,301 (54)	2024 (56)	766 (52)	1267 (60)	
Other <sup>b</sup>	13,433 (2)	69 (2)	29 (2)	36 (2)	
Unknown	153,523 (20)	675 (19)	295 (20)	356 (17)	

1 **Supplemental online material: Table 3**

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5 *Descriptive statistics, alphas, and zero-order correlations among the study variables*

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	M	SD	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.	16.	17.	18.	19.
1. Intrinsic Aspirations	6.05	0.98																			
2. Autonomy satisfaction	4.34	1.15	.23**	.68																	
3. Competence satisfaction	6.28	0.76	.55**	.27**	.88																
4. Relatedness satisfaction	5.52	0.90	.39**	.40**	.40**	.71															
5. Need satisfaction	5.38	0.71	.48**	.80**	.67**	.78**	.80														
6. Integrated regulation	5.72	0.92	.48**	.25**	.34**	.29**	.38**	.79													
7. Intrinsic regulation	5.75	0.89	.49**	.25**	.42**	.33**	.43**	.61**	.77												
8. Autonomous motivation	5.73	0.81	.54**	.28**	.42**	.34**	.44**	.90**	.89**	.84											
9. Job Satisfaction	3.74	1.14	.16**	.44**	.15**	.27**	.41**	.26**	.24**	.28**	-										
10. Depression risk	1.35	0.60	-.08**	-.33**	-.12**	-.23**	-.32**	-.010**	-.13**	-.12**	-.34**	.86									
11. Perceived ill health	1.86	0.89	-.09**	-.13**	-.13**	-.14**	-.17**	-.06**	-.13**	-.10**	-.12**	.28**	-								
12. Burnout	2.21	0.90	-.12**	-.49**	-.13**	-.23**	-.40**	-.20**	-.19**	-.22**	-.49**	.55**	.21**	-							
13. Leave practice	2.13	1.27	-.10**	-.28**	-.09**	-.18**	-.26**	-.14**	-.10**	-.14**	-.33**	.20**	.10**	.31**	-						
14. Leave medicine	1.79	1.24	-.12**	-.17**	-.08**	-.12**	-.17**	-.10**	-.08**	-.10**	-.19**	.13**	.09**	.19**	.57**	-					
15. Age	52.57	11.23	.02	.07**	.06**	.05*	.08**	.17**	.10**	.15**	.03	-.004	.11**	-.12**	.21**	.36**	-				

16. Gender	1.68	0.47	-0.06**	.05*	.06**	-0.01	.04*	-0.02	-0.00	-0.01	.02	.03	.06**	-0.06**	-0.00	.09**	.24**				
17. Owner	0.40	0.49	-0.01	.11**	.05*	.07**	.11**	.07**	.01	.05*	.00	-0.03	-0.04	-0.03	-0.12**	-0.01	.20**	.13**	-		
18. Employee	0.52	0.50	.02	-.10**	-.05*	-.04	-.09**	-.07**	-0.02	-.05*	.01	.02	-0.00	.03	.06**	-.04*	-.26**	-.14**	-.85**	-	
19. Contractor	0.07	0.25	-0.02	-0.02	.02	-.05*	-0.02	-0.01	.02	.00	-0.02	.04	.07**	0.01	.11**	.07**	.10**	.03	-.22**	-.28**	-

Note. Alphas on the diagonal. \*\*Correlation is significant at the 0.01 level (2-tailed). \*Correlation is significant at the 0.05 level (2-tailed). Gender: 1=men, 2=women.

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