The Need for Sense-Making as a Personal Resource: Conceptualization and Scale Development

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Abstract

We consider need for sense-making a personal resource and propose that people differ in their levels of this need. We present results of five studies (N = 879) that tested Need for Sense-Making Scale (NSM). The scale is unidimensional, highly reliable, and has satisfactory construct and criterion validity. Need for sense-making was moderately positively related to extroversion, openness, conscientiousness, self-esteem, and sense of control, while negatively related to neuroticism. There was an inverted U-shaped relationship between the need for sense-making and well-being. When individuals were presented with a meaningful task, searching for and presence of meaning sequentially mediate the relationship between need for sense-making and task performance. Need for sense-making predicts work engagement through searching for and presence of meaningful work.

Keywords: need for sense-making, personal resource, meaningfulness, individual differences, work engagement

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On 8 January 2010, a man posted a video on a popular internet site of his reaction to witnessing a double rainbow in Yosemite National Park. Since then, the video has been viewed over 48 million times and became a source of 'double rainbow' memes in the form of images, cartoons, and even music videos. What makes this video so special? In the recording the man is utterly overwhelmed by the experience and keeps asking himself 'What does it mean?!' His response may come across as excessively dramatic, conveying what seems like a desperation to make sense out of this beautiful yet commonplace natural phenomenon. However, perhaps not everybody is so inclined to search for meaning in these types of situations. The aim of this research is to better understand individual differences in the need for sense-making. We theorize that need for sense-making is a personal resource relevant to psychological functioning and we developed and evaluated the psychometric properties of an instrument to measure the need.

According to Frankl (2006) people are deeply motivated to search for meaning. Crescioni and Baumeister (2013, p. 13) wrote that "humans rely heavily upon socially shared meaning as they go through their lives". Also the Meaning Maintenance Model posits that people have a fundamental need for meaning (Heine, Proulx, & Vohs, 2006; Proulx, 2013; Proulx & Inzlicht, 2012). Similarly, Chater and Loewenstein (2016) propose a general drive for sense-making. We posit that people differ in the degree to which they have a need for sense-making. We conceptualize need for sense-making as a trait-like personal resource and propose that the construct can help to better understand meaning-making motivations, which have often been the focus of research in the flourishing area of existential psychology research and beyond. Before we set out our empirical approach, we start by defining our terms and distinguish these from other potentially related constructs.

What Sense-Making Does and Does Not Mean

We draw from the existing psychological literature to define the terms related to sense-making (e.g., Weick, 1995; Park, 2010; Steger et al., 2011; Van Tilburg & Igou, 2011)[1]. Adopting Baumeister's (1991) conceptualization, we define this 'sense' as a mental representation that concerns possible relationships among objects (e.g., events, physical things or relationships). It is the term used to denote what connects those objects.

Further terms for the conceptualization of the need for sense-making are 'sense-making' ('meaningful'), 'making no sense' ('meaningless') and the act of 'making sense'. 'Sense-making' reflects having reliable connections between things, events, and relationships. 'Making no sense' would be defined as lacking such connections. When sense is made of an event, it is considered meaningful. 'Making sense' is finding reliable connections between objects. Need for sense-making is thus defined as the desire to find reliable relationships between objects and/or situations that one encounters. This need is triggered when people are facing a discrepant or new situation. That is, when sense has already been made with regards to certain objects (e.g., I believe that dogs are furrier than humans), one would not need to engage in searching for meaning (e.g., When I see a regular dog that is furrier than a human being). Need for sense-making would be triggered when a new or a discrepant situation is faced (e.g., I find a person who is furrier than a dog).

While a concept such as 'meaning in life' is reserved for these representations that relate to one's life (e.g., identifying a life purpose) but not to other domains (e.g., making sense of a Kafka novel), need for sense-making is a general term that includes the more specific meaning assigned to people's experiences. Importantly, Steger and colleagues (2006) posit that searching for meaning in life differs across individuals: some search harder than others. While their findings pertain to meaning in life in particular, we propose that people

[1] We will use the terms 'meaningful' and 'meaningless' interchangeably with 'sense-making' and 'making no sense', respectively.

may more generally differ in the extent to which they search for meaning. Indeed, Baumeister (1991) argued that the functions of meaning at both low and high levels are often compatible and that they work together. While presence and searching for meaning in life are related to existential meaning making, need for sense-making focuses more on making sense out of concrete situations and experiences.

Need for Sense-Making as a Personal Resource

We propose that need for sense-making acts as a personal resource. Hobfoll (2002, p. 307) defines resources as "those entities that either are centrally valued in their own right (e.g., self-esteem, close attachments, health, and inner peace) or act as a means to obtain centrally valued ends (e.g., money, social support, and credit)." We propose that need for sense-making acts as a means to obtain meaning. In their broaden-and-build theory, Fredrickson (2003) proposes that positive emotions expand the repertoire of actions, cause people to be open to new information, and propel exploratory behavior. Positive emotions thereby create opportunities to acquire new knowledge, which, consequently, allows a greater repertoire to effectively deal with threats and demands. Need for sense-making, we propose, follows a similar process by preceding the active search for meaning, which, in turn, elevates possibility of finding meaning. For example, research shows that finding meaning in work predicts more positive work engagement (May, Gilson & Harter, 2004). In such a context, we propose that need for sense-making can play the role of an antecedent of work engagement through searching for and finding meaning in one's job.

Hobfoll (1989) further argues that individuals engage in obtaining valued resources and act to prevent negative outcomes. Individuals with a high need for sense-making should proactively seek meaningful activities and refrain from staying in situations that are meaningless. Hobfoll (2002) further states that resources are linked to one another. We expect need for sense-making to positively relate to other resources (e.g., self-esteem). Resources *per*

se are valued positively and possessing resources is viewed favorably (Hobfoll, 1998). Initial results from an exploratory study showed that when people were presented with a definition of the need for sense-making, their evaluation of the extent to which they possessed such a need was positively related to perceiving it as an important part of one's identity and viewing it as higher than that of others (Cantarero, Van Tilburg, Kuzma, Gasiorowska, & Wojciszke, 2019). This suggests that the need is viewed positively, as people state that they have higher levels of positively viewed features (i.e., the better than average effect, Taylor & Brown, 1988). According to Hobfoll (2002), very high levels of a resource do not have to be beneficial for individuals. Need for sense-making is triggered by new or discrepant situations. Additionally, people can re-assess their situation and search for meaning when situation of no new information is excessively prolonged (e.g. in case of boredom). Those who exhibit very high levels of this need frequently search for meaning when faced with such situations. However, because searching for meaning does not always result in finding meaning, and such situations are unpleasant, we assume that when need for sense-making is very high, this should be related to decreases in well-being.

To sum up, we propose that people who score high on the need for sense-making, compared to those scoring low, will demonstrate a greater tendency to stay both in situations where the search for meaning is still ongoing and situations that are identified as meaningful. Those who strongly seek to make sense are presumably more willing to spend time and effort on this process (for example because they find meaningless situations more discomforting), while those low in need for sense-making may be less willing to do so (for example because they find meaningless situations not very discomforting). Research shows that people in general prefer to perform activities that are meaningful (e.g., Ariely, Kamenica, & Prelec, 2008; Chandler & Kapelner, 2013) and find boredom to be aversive (e.g., Van Tilburg & Igou, 2011). We argue that this is especially true for people with a high need for sense-

making. Consequently, such persons perceive a subjectively meaningful work environment as important and motivating and will be more prone to engage in activities in such an environment compared to work in a meaningless one.

Need for Sense-Making and Related Constructs

There are good reasons for expecting that the need for sense-making is related to important other psychological variables. We discuss below where need for sense-making intersects possibly related constructs, and why it converges or diverges from these.

Big Five Personality Traits

Most likely, need for sense-making is positively related to openness, as people scoring high on this personality trait are open to new experiences and tolerant towards novelty (e.g., Costa & McCrae, 1992a; Costa & McCrae, 1992b). We base this expectation on the notion that the desire to find reliable relationships between objects at the level of personality can be reflected in general receptiveness to novelty. High need for sense-making is related to preference for staying in meaningful situations over meaningless ones. One of the facets of extroversion is the tendency to seek stimulation and a desire to be engaged in activities (e.g., Zawadzki, Strelau, Szczepaniak, & Sliwinska, 1998). As need for sense-making is expressed by unwillingness to remain in boring situations, extroversion should be positively related to this need. Persons high in need for sense-making are likely to be fully engaged in activities that they consider meaningful. Similarly, conscientiousness is related to a relatively strong motivation to realize one’s goals and, given that goal fulfilment is meaningful, we can expect a positive correlation between need for sense-making and conscientiousness. Neuroticism is a tendency to frequently experience negative emotions and to produce irrational thoughts. Both influence the process of adaptation to the environment (e.g., Zawadzki, Strelau, Szczepaniak, & Sliwinska, 1998). Because finding reliable connections between objects allows to better function in the environment, we expect a negative relationship between need for sense-

making and neuroticism. The facets of agreeableness are straightforwardness, modesty, and trust. We did not anticipate need for sense-making to relate to agreeableness, as the two constructs do not seem to overlap theoretically.

Basic Social Motives

We also consider individual differences in basic social motives to connect with need for sense-making. Sense of control is adaptive for people because it is accompanied by the motivation to work hard to improve one's fate in contrast to a sense of hopelessness (Lachman & Weaver, 1998). Need for sense-making is related to the desire to engage in meaningful pursuits and avoidance of meaningless ones. As such, it is probably related to a tendency to act towards accomplishing these goals. High need-for-sense-making individuals are likely inclined to engage in effort to change their circumstances and to find themselves in meaningful situations. We thus expect sense of control and need for sense-making to correlate positively. As we consider need for sense-making to be, in general, a positive resource and to have beneficial consequences for an individual's functioning, we expect a positive relation between this construct and the level of self-esteem. Need to belong is related to the desire to be accepted by others and dislike of being alone (Leary, Kelly, Cottrell, & Schreindorfer, 2013). Humans are social animals (Aronson, 2011) and the desire to stay connected with others is beneficial for people. Additionally, it was found that the feeling of belongingness is related positively to presence of meaning (Moynihan, Igou, & Van Tilburg, 2017). We anticipate that need for sense-making is related positively to need to belong.

Overview of the Studies and Contribution Brief

To conclude, the aim of this research was to better understand sense making motivation in the context of individual differences. We aimed at finding an answer to the question of whether some individuals are more inclined to search and find meaning in everyday life events than others and wanted to test for whom is situational meaningfulness

more attractive. We propose that need for sense-making is a personal resource and that people differ in the levels of the need. We thus designed a scale to measure these differences and tested its psychometric properties in nine studies. In Study 1, as well as is additional studies presented in Supplementary Materials, we tested uni-dimensional structure of need for sense-making in various samples. In Study 2 we tested the convergent and divergent construct validity of the Need for Sense-Making Scale (NSM) score interpretation by analyzing its relation to Big Five personality traits, sense of control, self-esteem and need to belong. In Study 3, we examined criterion concurrent validity of NSM score interpretation by investigating the relationship between need for sense-making and psychological well-being. Finally, in Study 4a and Study 4b we further examined the criterion validity of the Need for Sense-Making Scale score interpretation, testing whether people high in need for sense-making engaged more in searching for meaning in undertaken activities, were more likely to find meaning in a potentially meaningful task, and, as a result, engaged more in such a task.

Study 1

Literature shows that many of the constructs related to meaning regulation are unidimensional (e.g., *need for meaning*, Abeyta & Routledge, 2018; *spiritual meaning scale*, Mascaro, Rosen, & Morey, 2004). The aim of Study 1 was to test the unidimensional structure of need for sense-making relying on a non-student sample[2].

Method

Participants and Recruitment. We aimed at gathering the maximum number of participants with the funds available to us within the time period we had to collect the data. Participants were 194 members (107 women, 84 men, 3 undisclosed) of a research portal in Poland, who participate in research in exchange for points. The age of the participants ranged

[2] In Study S1 presented in Supplementary Materials we conducted EFA, which indicated a unidimensional structure of the construct. Additionally, in Study S4 relying on British and Polish samples, we found configural invariance of the unifactorial model.

from 18 to 77 (M_{age} = 41.70, SD_{age} = 13.95). Four percent of participants had a primary education, fifty-seven percent had a secondary education, and thirty-nine percent of participants had higher education.

Procedure and Materials. After giving their informed consent, participants filled in the 29-item Need for Sense-Making Scale (Appendix 1). We gathered demographic data afterwards.

Results and Discussion

We tested whether the data corresponded to the unidimensional model. A diagonally weighted least squares confirmatory factor analysis (CFA) yielded good fit χ^2/df = 1.67, RMSEA = .059 (90% CI = [.051, .067]), GFI = .94, TLI = .96, CFI = .97, IFI = .97, SRMR = .10. Additionally, the Cronbach's α was very high, α = .92. These results confirm the unidimensional structure of the need for sense-making.

[Please insert Table 1 here]

Table 1 presents factor loadings and descriptive statistics of each of the items. The reverse-coded items received the lowest factor scores. Nevertheless, we decided not to exclude them, as inclusion of reverse scored items brings the benefit of controlling for acquiescence and allows to more broadly cover the content of a construct (Weijters, & Baumgartner, 2012). Furthermore, we found that need for sense-making scores did not deviate from normal distribution, $D(194) = 0.06$, $p = 0.089$, $M = 5.06$, $SD = 0.76$.[3] The results of this study showed that the NSM is unidimensional and has satisfactory internal consistency.

Study 2

[3] Studies S2 and S3 presented in the Supplementary Materials show additional tests of the psychometric properties of the need for sense-making scale. Study S2 indicated language invariance of the English and Polish version of the scale. Study S3 showed that the NSM scores are reasonably stable over time.

In Study 2 we tested the convergent and discriminant construct validity of the Need for Sense-Making Scale score interpretation using Campbell and Fiske's method (discussed in Anastasi & Urbina, 1997), and examined whether need for sense-making is related to personality traits, sense of control, self-esteem, and need to belong. We consider need for sense-making as a trait-like construct. Therefore, we expect it to relate to personality traits and selected individual differences. Positive correlations between the need for sense-making and openness to experience, extroversion, conscientiousness, sense of control, self-esteem, and need to belong, and negative correlation between NSM and neuroticism would be a confirmation of NSM convergent validity. We did not have any reasons to predict that need for sense-making should be related to agreeableness, therefore, lack of correlation between NSM and this trait would be a support for its divergent validity. Additionally, lack of complete overlap between NSM and the tested variables would support discriminant validity of the scale.

Method

Participants and Recruitment. We aimed at reaching the maximum number of participants we could, within the time period we had to conduct the study. Participants were 256 Polish students (220 women, 33 men, 3 undisclosed), M_{age} = 26.84, SD_{age} = 8.34, who took part in the online study in exchange for course credit points. The overall sample size yields corresponding power in excess of $(1 - \beta) = .80$, for absolute r value of .13 ($\alpha = .05$, two-tailed).

Procedure and Materials. Participants completed the ten-item personality inventory (TIPI; Gosling, Rentfrow, & Swann, 2003; Sorokowska, Slowinska, Zbieg, & Sorokowski, 2014), which measures extroversion (α = .66, '*Extraverted, enthusiastic*'), agreeableness (α = .62, '*Sympathetic, warm*'), conscientiousness (α = .71, '*Dependable, self-disciplined*') neuroticism (α = .69, '*Anxious, easily upset*'), and openness (α = .39, '*Open to new*

experiences, complex') on a range of 1 = *definitely disagree* to 7 = *definitely agree*. Each subscale is comprised of two items. We also included the 12-item Sense of Control Scale (α = .88, e.g., '*I can do just about anything I really set my mind*', 1 = *definitely disagree* to 7 = *definitely agree*; Lachman & Weaver, 1998); the 10-item Rosenberg Self-Esteem Scale (α = .90, e.g., '*I feel that I have a number of good qualities*', 1 = *definitely agree* to 4 = *definitely disagree*; Rosenberg, 1965; Dzwonkowska, Lachowicz-Tabaczek, & Laguna, 2008); the 10-item Need to Belong Scale (α = .84, e.g., '*I try hard not to do things that will make other people avoid or reject me*', 1 = *definitely disagree* to 5 = *definitely agree*; Leary, Kelly, Cottrell, & Schreindorfer, 2013); and finally our own 29-item NSM (α = .93). The scales were presented in counterbalanced order. At the end of the study, participants reported demographic information.

Results and Discussion

As expected, need for sense-making was positively correlated to openness to experience, self-esteem, extroversion, conscientiousness, and sense of control (Table 2).

[Please insert Table 2 here]

These findings are in line with Hobfoll (2002) who argues that resources relate to other resources. Though need for sense-making was negatively related to neuroticism, this relationship was not strong and it did not reach the conventional *p* value (*p* = .058). Need for sense-making was not significantly related to agreeableness, *p* = .778, or need to belong, *p* = .30. Contrary to our predictions, need for sense-making did not relate positively to need to belong. It should be further investigated whether the results obtained in this study between need for sense-making and need to belong can be attributed to the type of instrument used to measure need to belong, or whether need for sense-making and need to belong are indeed unrelated. Additional analysis (see Supplementary Materials) indicated that the Average Variance Extracted (AVE) value of NSM (.33) was higher than that of squared correlations

between the regression based estimates of factor scores of NSM and the regression based estimates of factors of other measured variables (≤.05). This suggests that there is no complete overlap between the measured variables, and is typically interpreted as confirmation of discriminant validity. These results generally show convergent and discriminant validity of the Need for Sense-Making Scale and provide a basis for future related studies.[4]

Study 3

In this study we examined criterion concurrent validity of NSM score interpretation by investigating the relationship between need for sense-making and psychological well-being. As mentioned before, we propose that need for sense-making is in general beneficial for an individual. At the same time, we suspect that the relationship between need for sense-making and well-being is not linear, but rather we expect a curvilinear relationship between the two constructs. The curvilinear relation between need for sense-making and well-being will serve as an additional test of the validity of the NSM.

Method

Participants and Recruitment. We aimed at reaching the maximum number of participants we could, within the time period we had to conduct the study. Polish students (152, 134 women, 16 men, 2 undisclosed), M_{age} = 28.46, SD_{age} = 9.44 took part in an online study in exchange for course credit. The overall sample size yields a corresponding power of (1 – β) = .80, for upper value of R^2 of .03 (α = .05, two-tailed).

Procedure and Materials. Participants completed the 29-item Need for Sense-Making Scale (α = .94) and 5-item Satisfaction with Life Scale (α = .87, e.g, '*In most ways my life is close to my ideal*', 1 = *strongly disagree* to 7 = *strongly agree;* Diener, Emmons, Larsen, & Griffin, 1985). At the end of the study, participants reported demographic data.

[4] An additional study presented in Supplementary Materials (S5) further showed that need for sense-making is positively and moderately related to need for cognition, need for closure, preference for consistency, searching for meaning and presence of meaning in life.

Results and Discussion

Mean levels of need for sense-making were similar to those in the previous studies, *M* = 5.37, *SD* = 0.82. Participants evaluated their levels of well-being above the mid-point of the scale, *M* = 4.70, *SD* = 1.18. Linear regression analysis showed that need for sense-making did not relate to satisfaction with life in a statistically significantly $F(1, 150) = 2.83$, $p = .095$, $R^2 = .02$, $\beta = .14$. We tested the relationship between need for sense-making and satisfaction with life for curvilinearity, calculating a quadratic function of need for sense-making on satisfaction with life. The results showed that such a function is indeed a better fit to the data than a linear equation, $F(2, 149) = 3.21$, $p = .043$, $R^2 = .04$, $b_1 = 2.21$, $b_2 = -.19$ and is expressed in the equation:

$$y = -1.44 + 2.21X - 0.19X^2 + e$$

This indicates that the relationship between need for sense-making and satisfaction with life is curvilinear: the higher the need for sense-making, the higher the satisfaction with life. However, at higher levels of need for sense-making the relationship between need for sense-making and satisfaction with life reverses (Figure 1).

[Please insert Figure 1 here]

The results confirm that the relationship between need for sense-making and well-being is curvilinear and that very high levels of need for sense-making are related to a drop in well-being. This supports criterion validity of the Need for Sense-Making scale score interpretation.

Study 4a

Study 4a further examined the criterion validity of the Need for Sense-Making Scale score interpretation, using a correlational design and zeroing in on the presumed motivational function of the need for sense-making. We examined if people high in need for sense-making engaged more in searching for meaning in undertaken activities, were more likely to find

meaning in a potentially meaningful task, and, as a result, engaged more in such a task. Thus, we expected a positive correlation between the need for sense-making score, searching for meaning, presence of meaning, and number of trials solved in a task. We also tested whether people's search for meaning and the presence of meaning would mediate the relationship between need for sense-making and behavioral indicators of task engagement. Additionally, we tested any possible gender differences using a sample coming from a general population.

Method

Participants and Recruitment. We aimed at reaching at least 80 participants. Participants were 88 MTurkers (46 women, 42 men) who took part in this online study in exchange for 0.20 USD. We excluded four participants who spent less than 60 seconds on completing the NSM. The final sample consisted of 84 participants (45 women, 39 men), with age ranging from 19 to 69 (M_{age} = 37.55, SD_{age} = 13.44). With the overall sample size this study allowed us to detect effect size of upper value of R^2 of .11 ($\alpha = .05$, two-tailed) with power of $(1 - \beta) = .80$.

Procedure and Materials. After giving informed consent and providing demographic information, participants completed the Need for Sense-Making Scale (Cronbach's $\alpha = .86$). Then, participants worked on a task in which they had to identify irregularities in cells due to malaria infection, a modified task from Chandler and Kapelner (2013) that they used as an example of a meaningful task. Specifically, we prepared 30 photos of human blood cells. Some of the cells on the photos were irregular as a consequence of malaria infection. We told participants that these photographs of human cells contained irregularities, which we called 'potentially infected cells'. We instructed participants to highlight these potentially infected cells and that this would help us understand how people identify infections, ultimately improving treatment. We then showed a test trial with an infected cell highlighted. We next informed participants that they could work on as many trials as they wanted, and that doing

more trials would not increase their reward for taking part in the study. We presented the photos in a random order to the participants and tallied the number of trials that the participants decided to complete.

After participants decided to finish this activity, they answered questions measuring whether they had searched for meaning in the tasks ('*Have you searched for meaning in these tasks?*' and '*Did you put much effort into making sense of these tasks?*', 1 = *not at all*, 7 = *very much*, $r(84) = .43$, $p < .001$) and whether they found meaning in the tasks ('*Did these tasks make sense to you?*' and '*Were these tasks meaningful to you?*', 1 = *not at all*, 7 = *very much*, $r(84) = .72$, $p < .001$). Participants were debriefed at the end of the study.

Results and Discussion

First, we analyzed whether there were any gender differences in the need for sense-making. Results showed that women ($M = 4.92$, $SD = 0.79$) did not significantly differ in the levels of the need from men ($M = 4.80$, $SD = 0.67$), $p = .443$. Due to non-normal distribution of the variable number of tasks completed, we log transformed it. The transformed variable had acceptable values of kurtosis (-0.75) and skewness (0.83). In the subsequent analyses, we have used the transformed number of tasks as our dependent variable. Next, we conducted a correlation analysis between need for sense-making, search for meaning, evaluation of meaningfulness of the task, and the number of tasks that a participant wanted to engage in (Table 3). Participants with high need for sense-making, compared to those with low need for sense-making, were more likely to search for meaning in the task, but did not choose to do more tasks and did not see more meaning in it.

[Please insert Table 3 here]

In the next step we tested the serial multiple mediation model to determine whether the level of need for sense-making (predictor variable, X) had an association with the number of tasks solved (outcome variable, Y) through changes in other variables such as search for

meaning and presence of meaning (mediator variables, $M_1$and M_2) situated in a path between X and Y (Hayes, 2013). We tested for this possible indirect association using sampling with replacement, with a bias-corrected bootstrapping procedure (10,000 samples). Results showed that the overall model was significant, $F(3, 80) = 6.02$, $p < .001$, $R^2 = .18$. The total association between need for sense-making and the number of the tasks completed was not significant, $c = 0.03$, se = 0.05, $t(82) = 0.64$, $p = .527$, 95% CI [-0.07, 0.13]. The direct association between need for sense-making and the number of tasks (controlling for both mediators) was weaker and also not significant, $c' = 0.02$, se = 0.05, $t(80) = 0.33$, $p = .745$. The 95% bootstrapped confidence intervals for the indirect associations through one mediator included zero, respectively 95% boot CI [-0.01, 0.05], $a_1b_1= 0.02$, boot se = 0.02 for indirect path through search of meaning (M_1), and 95% boot CI [-0.06, 0.02], $a_2b_2 = -0.02$, boot se = 0.02 for indirect path through presence of meaning (M_2), suggesting that these effects were not significant. Critically, the indirect association through both mediators was significant, as the 95% bootstrapped confidence interval did not include zero, 95% boot CI [0.001, 0.04], $a_1d_{21}b_2= 0.02$, boot se = 0.01 (see Figure 2).

[Please insert Figure 2 here]

These results indicate that a higher need for sense-making is associated with greater search for meaning in a task, which is in turn associated with more perceived meaning in the task and, in turn, a greater willingness to engage in the task. These results of serial multiple indirect association support the criterion concurrent validity of the need for sense-making.

Study 4b

In Study 4b we tested the robustness of the serial mediation with searching and presence of meaning found in Study 4a. This time, however, we focused on work engagement (e.g., Bakker & Demeoruti, 2017) as the outcome variable. We hypothesized that high need for sense-making is related to searching for meaning at work, perceiving the work as

meaningful, which in turn predicts work engagement. Finding this sequential mediation would lend further support for criterion validity of NSM. We pre-registered the study at aspredicted.org (http://aspredicted.org/blind.php?x=y2yh26).

Method

Participants and Recruitment. We aimed at reaching at least 176 participants. The sample size estimate was calculated assuming power (1-β) = .95, probability level α = .05 and small effect sizes (f^2 = 0.10). The entire sample consisted of 185 participants. After excluding one participant who was currently unemployed, the sample consisted of 184 MTurk workers that were currently employed. Participants (97 women, 86 men, 1 undisclosed, M_{age} = 39.44, SD_{age} = 11.28) took part in this online study in exchange for 1 USD. Eighty-nine percent of the MTurk participants were employed full-time and the remaining ones part-time. Sixty-five percent of participants had an overall experience of more than 10 years, close to 16% of participants have worked between five and ten years and 19% have had an up to five years of working experience in general. 21% of participants have worked two years or less at their current position, 37% worked between two and five years and the remaining participants worked at their current position more than five years. Over 18% of participants declared that their experience level was entry, mid level experience declared nearly 44% of the sample and the remaining participants declared having senior experience level. Nearly 24% of the participants had up to US30,000$ of annual income. More than 42% of the sample declared having between US30,001$ and US60,000$ and the remaining 24% of participants declared that their income was above US60,001$. In terms of education, 38% of the participants had associate degree or lower, 40% of the sample held a Bachelor's degree and the remaining 22% held a Master's or a higher degree.

Procedure and Materials. After giving informed consent, participants completed the 29-item Need for Sense-Making Scale (Cronbach's α = .92). Then, participants responded to

three questions regarding searching for meaning of their work (α = .61, '*I search for meaning of my job activities.*', '*I sometimes wonder about the purpose of my work.*', '*I think about the meaning of my work.*') and three questions from Spreitzer (1995) regarding perceived meaningful work (α = .96, '*The work I do is very important to me.*', '*My job activities are personally meaningful to me.*', '*The work I do is meaningful to me.*'). Participants replied to these questions using a 1 = *strongly disagree* to 5 = *strongly agree* scale. We then presented participants with the 17-item work engagement scale (UWES, α = .61, e.g., '*When I am working, I forget everything else around me*', 0 = *never,* to 6 = *always,* Schaufeli & Bakker, 2004a).

Then, we asked for additional questions regarding employment (e.g., level of experience) and demographics. Participants were debriefed at the end of the study.

Results and Discussion

We conducted an analysis of correlations between need for sense-making, search for meaning of work, work meaningfulness, and work engagement (Table 4).

[Please insert Table 4 here]

The higher the need for sense-making, the higher the searching for meaning in work, the higher the perceived work meaningfulness and work engagement. Work engagement was also positively related to searching and presence of meaning at work. Additionally, searching for meaning and work meaningfulness were positively correlated.

Next, we tested the serial multiple indirect model to determine whether the level of need for sense-making was associated with work engagement through changes in searching for meaning of work and work meaningfulness. We tested for a serial indirect association using bias-corrected bootstrapping procedure (10,000 samples). Results showed that the overall model was significant, $F(3, 180) = 71.80$, $p < .001$, $R^2 = .54$. The total association between need for sense-making and work engagement was significant ($c = 0.42$, se = 0.10,

$t(182) = 4.14$, $p < .001$, 95%CI [0.22, 0.62]). The direct association between need for sense-making and work engagement controlling for searching and presence of meaning was not significant (c' = -0.07, se = 0.08, $t(180)$= -0.84, p = .405, 95%CI [-0.24, 0.10]). The 95% bootstrapped confidence intervals for the indirect association through searching for meaning of work included zero, 95% boot CI [-0.05, 0.22], a_1b_1= 0.11, boot se = 0.07. The indirect path through meaningful work was significant, 95% boot CI [0.12, 0.43], a_2b_2 = 0.28, boot se = 0.08. Importantly, the indirect association through both searching and presence of meaningful work was significant, as the 95% bootstrapped confidence interval did not include zero, 95% boot CI 0.03, 0.22], $a_1d_{21}b_2$= 0.10, boot se = 0.05 (see Figure 3).

[Please insert Figure 3 here]

These results confirm the hypothesized relationship in that higher need for sense-making predicts greater search for meaning in work, which in turn predicts a greater perception of meaningful work, which predicts greater work engagement. These results support the criterion construct validity of the need for sense-making.

General Discussion

Results of the present studies show that need for sense-making is a unidimensional construct, similarly to other constructs related to meaning regulation (e.g., Abeyta & Routledge, 2018). The results also confirmed construct validity of the need for sense-making scores interpretation. Evidence of convergent and discriminant construct validity was found in Study 2, where we found that need for sense-making is positively related to openness, sense of control, self-esteem, extraversion, and conscientiousness. The positive correlation between need for sense-making and self-esteem is in line with the notion that personal resources relate to one another (Hobfoll, 2002). The results of this study show more generally that need for

sense-making relates to core personality variables, which provides grounds for further research on personality psychology and need for sense-making.

We conceive need for sense-making as a personal resource. Need for sense-making should be expressed by a preference for staying in situations that are meaningful for the individual and help to reach goals more effectively. We propose that a very high need for sense-making is related to a decline in well-being, as individuals with such high levels of this need are likely to experience frustration related to their need. An extremely high need for sense-making may be difficult to satisfy and thus results in a decline in well-being. The results of Study 3 indeed indicate that need for sense-making and well-being have a curvilinear relationship, and provide further evidence of criterion concurrent validity for the NSM score interpretation.

Additional support for considering need for sense-making a personal resource was found in Study 4a and Study 4b. Need for sense-making should be expressed by a preference for staying in situations that are meaningful for the individual and help to reach goals more effectively. The results of Study 4a indicated that when the task is meaningful, a high need for sense-making is related to searching for meaning in the task and finding it, which is in turn related to a higher tendency to engage in a task. We extended these findings in Study 4b, where we showed that the serial mediation model predicts work engagement. The relationship between need for sense-making and work engagement was statistically transferred by searching for meaning of work and work meaningfulness.

The results of this research allow to better understand sense making motivation. We proposed and found that especially individuals with high need for sense-making strive to find, and feel motivated to engage in, meaningful activities. The results of our studies help to understand the role of individual differences in meaning making processes. Need for sense-making contributes to the extent to which individuals are inclined to find meaning in the

events, situations that around them. Be it a double rainbow, activities at work or performance of an abstract task. Being able to assess individual differences in need for sense-making further aids our understanding of people's reactions towards meaningful and meaningless situations. While individuals with high need for sense-making are more motivated to perform activities when they are more meaningful, meaning related nudges will not trigger higher task involvement of individuals with low NSM.

Limitations and Future Directions

Additional studies would be helpful to establish the cognitive, emotional and behavioral consequences of the need for sense-making. Furthermore, the studies were mostly conducted on university students with majority of participants being women. Although we did not find significant gender differences in the need for sense-making, it would be valuable to conduct more studies with need for sense-making relying on samples taken from the general population. The fact that the conducted studies repeatedly show similar patterns of results (e.g., high internal consistency of the NSM score) bolsters our confidence in the results. Two studies found support for the sequential mediation of searching and presence of meaning in the relationship between need for sense-making and work engagement. However, testing indirect associations with self-report and cross-sectional data cannot exclude the possibility that the relationships could be bi-directional. Future research should focus on longitudinal and experimental data to provide empirical evidence of the causal order between searching and presence of meaning.

Importantly, individual differences in the need for sense-making are relevant for work and organizational psychology. Meaningful work has been identified as an important factor for performance at work and work engagement (Hackman & Oldham, 1976; Schaufeli & Bakker, 2004b). Additionally, individual differences (e.g., extroversion and neuroticism) were found to be related to work engagement (Langelaan, Bakker, van Doornen, & Schaufeli,

2006). Chosen personal resources (e.g., high optimism, self-efficacy, self-esteem and positive affectivity) are also antecedents of work engagement (Schaufeli & Bakker, 2014). Woods and Sofat (2013) showed that the relationship that certain personality traits (i.e., assertiveness and industriousness) have with work engagement is mediated through work meaningfulness. Similarly, we showed that searching for and presence of meaningful work mediates the relationship between need for sense-making and work engagement. Future studies could test this relationship in a longitudinal study.

Conclusion

We proposed that need for sense-making is considered a personal resource and we developed a measure of that need. We found that the scale to measure individual differences in the need for sense-making is reliable, valid, and structurally coherent. The studies on need for sense-making has provided data that reveals important insights into the construct. The focus on the need for sense-making as a personal resource also offers guidance to directions of future studies. Individual differences in need for sense-making can be effectively combined with situational factors that may be of high importance for basic and applied studies. The results of such studies could be of further possible utility to organizational and clinical psychology.

Compliance with Ethical Standards

Funding

This study was funded by XXX.

Ethical Approval

All procedures performed in studies involving human participants were in accordance with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The research within the project presented here was approved by the Departmental Research Ethics Committee of XXX.

Informed Consent

Written informed consent was obtained from all individual participants included in the studies.

Conflict of Interest

On behalf of all authors, the corresponding author states that there is no conflict of interest.

Data availability

The data sets generated during and/or analysed during the current study are available in the osf.io repository, https://osf.io/t4dpv/.

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Appendix 1

Need for Sense-Making Scale

Please indicate how much each of the following statements reflects how you typically are, using the scale provided.

Not at all 1 2 3 4 5 6 7 Very much

1. I like it when I stop feeling bored
2. I often get engaged in meaningful activities
3. When I'm in a new situation I can't avoid searching for meaning in it
4. When I can't make sense of a situation I usually feel upset
5. When I do something that is meaningless I feel bad
6. When I do something that is meaningful I feel good
7. When I can't find the purpose of a situation it's unpleasant
8. Even if a new situation is of little importance I would still try to find the purpose of it
9. I don't like to feel bored
10. I prefer to do things that are meaningful
11. When I am in a new situation I try to find meaning in it
12. When I make sense of a situation it is pleasant to me
13. Usually, when I do something that is meaningless I want to switch to something else
14. Usually, when I encounter an unclear situation I try to make sense of it
15. When I feel bored I quickly try to do something to change it
16. **When things have no meaning it doesn't bother me at all**
17. **I don't pursue purposeful activities**
18. I search for activities that serve a purpose
19. I often engage myself in making sense of different situations
20. I tend to search for the meaning of unclear situations until I find it
21. **I don't mind feeling bored**
22. I avoid situations that make no sense
23. I don't like it when things serve no purpose
24. **I don't usually try to find the purpose of things**
25. **Doing pointless activities doesn't bother me**
26. When I'm in an unexpected situation, the first thing that I want to do is to find meaning in it
27. When I evaluate an activity as pointless I lose interest in doing it
28. I often wonder what the relationships are between things
29. I avoid doing boring things

Note. Reverse coded items are in bold.

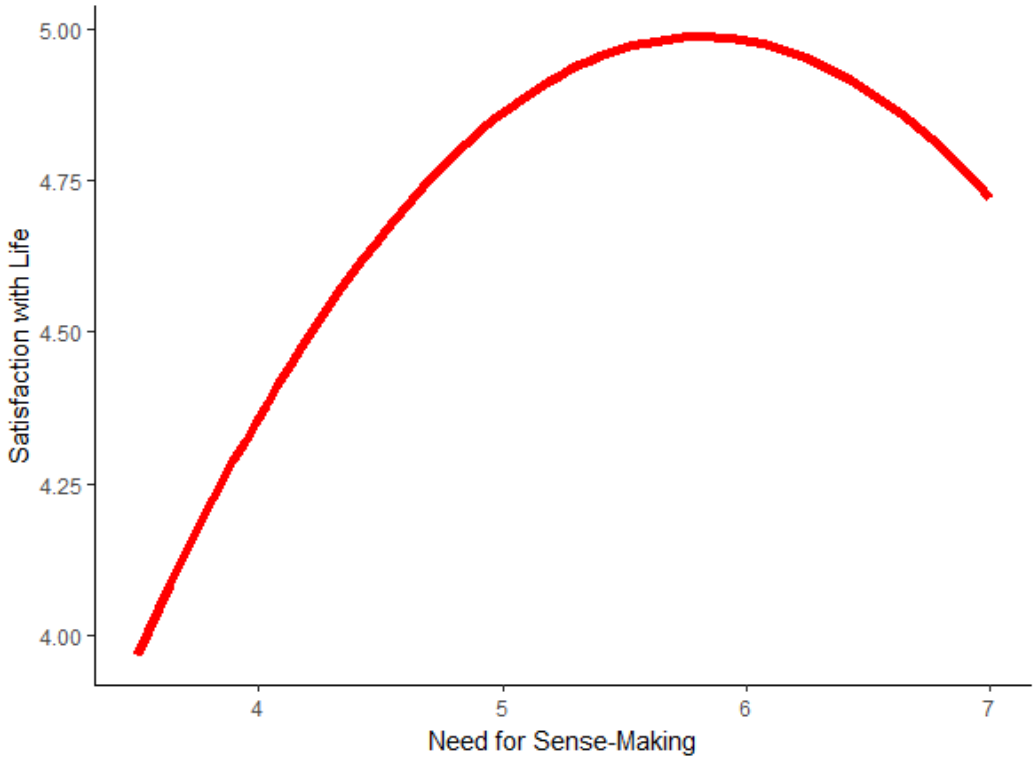

Figure 1. Satisfaction with life and the need for sense-making. Quadratic function of the relationship (Study 3).

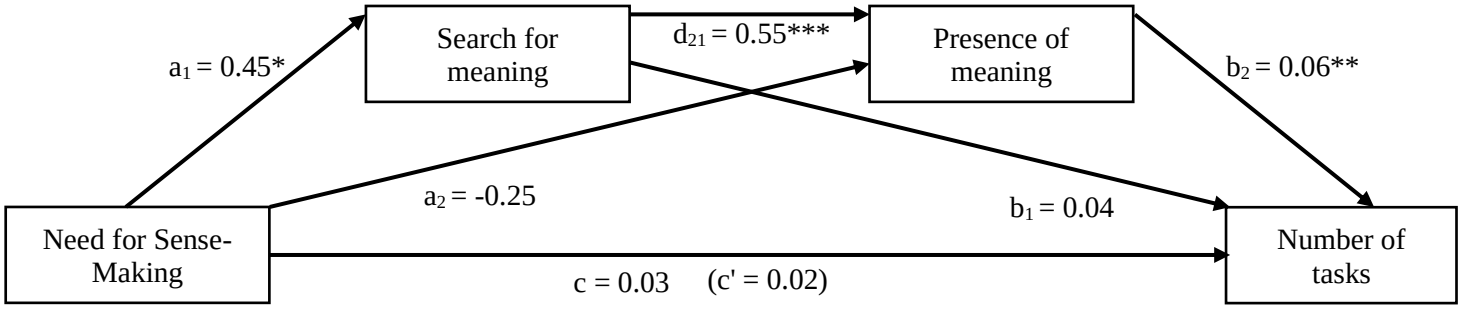

Figure 2. Serial mediation model with need for sense-making as the predictor variable of the number of tasks performed and searching and presence of meaning as mediators (Study 4a), * $p < .05$, ** $p < .01$, *** $p < .001$.

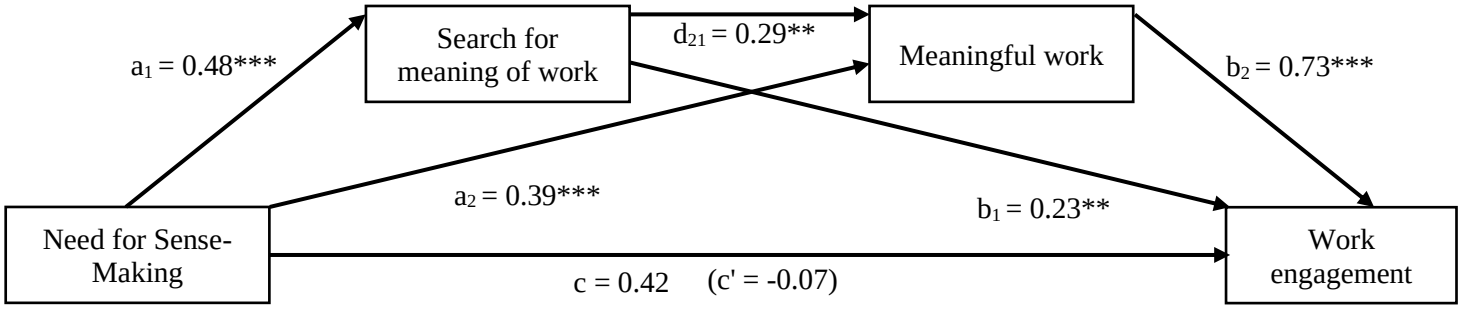

Figure 3. Serial mediation model with need for sense-making as the predictor variable of the work engagement and searching for work meaning and meaningful work as mediators (Study 4b), * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 1
Factor loadings, mean and standard deviation for the 29 items of the Need for Sense-Making Scale, Study 1.

Item	Estimate	M	SD
18. I search for activities that serve a purpose	0.978	5.22	1.25
09. I don't like to feel bored	0.962	5.50	1.32
12. When I make sense of a situation it is pleasant to me	0.961	5.60	1.20
06. When I do something that is meaningful I feel good	0.942	5.64	1.50
10. I prefer to do things that are meaningful	0.938	5.60	1.18
11. When I am in a new situation I try to find meaning in it	0.878	5.22	1.12
15. When I feel bored I quickly try to do something to change it	0.868	5.22	1.27
22. I avoid situations that make no sense	0.858	5.07	1.31
01. I like it when I stop feeling bored	0.855	5.53	1.36
13. Usually. when I do something that is meaningless I want to switch to something else	0.853	5.21	1.33
05. When I do something that is meaningless I feel bad	0.848	5.39	1.24
14. Usually. when I encounter an unclear situation I try to make sense of it	0.845	5.36	1.21
02. I often get engaged in meaningful activities	0.842	5.36	1.25
19. I often engage myself in making sense of different situations	0.803	5.17	1.22
04. When I can't make sense of a situation I usually feel upset	0.755	5.22	1.18
28. I often wonder what the relationships are between things	0.715	4.96	1.25
23. I don't like it when things serve no purpose	0.714	5.09	1.23
20. I tend to search for the meaning of unclear situations until I find it	0.695	5.01	1.17
07. When I can't find the purpose of a situation it's unpleasant	0.688	5.20	1.25
27. When I evaluate an activity as pointless I lose interest in doing it	0.675	4.81	1.39
29. I avoid doing boring things	0.644	5.04	1.40
26. When I'm in an unexpected situation. the first thing that I want to do is to find meaning in it	0.637	4.78	1.34
08. Even if a new situation is of little importance I would still try to find the purpose of it	0.630	5.03	1.19
03. When I'm in a new situation I can't avoid searching for meaning in it	0.527	4.85	1.16
25. Doing pointless activities doesn't bother me	0.487	4.60	1.72
21. I don't mind feeling bored	0.448	4.21	1.76
17. I don't pursue purposeful activities	0.265	4.49	1.63
16. When things have no meaning it doesn't bother me at all	0.263	4.46	1.59
24. I don't usually try to find the purpose of things	0.243	4.04	1.69

Table 2
Descriptive Statistics and Multitrait-Multimethod Matrix Relying on Spearman Correlations for Study 2.

Variable	1	2	3	4	5	6	7	8	*M*	*SD*
1. Need for Sense-Making	-								5.40	0.75
2. Extroversion	.20**	-							5.51	1.37
3. Agreeableness	-.02	.18**	-						5.35	1.19
4. Conscientiousness	.14*	.22**	.26***	-					5.30	1.41
5. Neuroticism	-.12	-.45***	-.28***	-.19**	-				3.74	1.60
6. Openness	.20**	.31***	-.01	-.02	-.21**	-			5.22	1.14
7. Sense of Control	.15*	.38***	.16*	.27***	-.54***	.27***	-		5.01	0.90
8. Self-esteem	.21**	.48***	.25***	.34***	-.58***	.30***	.65***	-	3.04	0.56
9. Need to belong	.07	-.05	.08	.05	.33***	-.26***	-.39***	-.37***	3.49	0.76

Note. $N = 256$, $^{*}p < .05$, $^{**}p < .01$, $^{***}p < .001$.

Table 3

Descriptive Statistics and Correlations between Need for Sense-Making, search for meaning, evaluations of meaningfulness, and performance in cancer-cell searching task (Study 4a). Number of tasks completed is log-transformed. The number of tasks before log-transformation is in parenthesis.

Variable	1	2	3	*M*	*SD*
1. Need for Sense-Making	-			4.88	0.74
2. Number of tasks completed	.07	-		0.27(2.64)	0.34(2.54)
3. Search for meaning	.23*	.31**	-	4.20	1.45
4. Perceived meaningfulness	-.002	.39**	.43**	4.15	1.76

Note. $N = 84$, *$p < .05$, **$p < .01$.

Table 4

Descriptive Statistics and Correlations between Need for Sense-Making, searching for meaning at work, work meaningfulness, and work engagement (Study 4b).

Variable	1	2	3	*M*	*SD*
1. Need for Sense-Making	-			4.92	0.82
2. Searching for meaning at work	.47***	-		3.72	0.82
3. Work meaningfulness	.39***	.35***	-	3.89	1.11
4. Work engagement	.29***	.38***	.73***	4.95	1.17

Note. $N = 184$, *$p < .05$, ***$p < .001$.

Supplementary Materials

The Need for Sense-Making as a Personal Resource: Conceptualization and Scale Development

Initial Item Generation

During the first step of the scale's development, we generated thirty items that presumably captured the need for sense-making. The items referred to emotional, cognitive and behavioral characteristics of the need for sense-making, and they were related to both the epistemic and teleological aspect of the construct. To assess the content validity of the items, they were rated by three psychologists provided with a definition and conceptualization of need for sense-making, who served as competent judges. These three judges rated whether the items reflected the concept of need for sense-making on a 0-2 scale (0 = does not represent the need for sense-making well at all, 1 = represents the need for sense-making poorly, 2 = represents need for sense-making well), following Lawshe (1975) recommendations for Content Validity Ratio. All items were evaluated as strongly representative of the need for sense-making by at least one of the judges; none of the items was evaluated as poorly reflecting the need for sense-making by all judges. Additionally, judges expressed no concerns regarding the linguistic aspect of the items. After exclusion of one item that was a double negation, we accepted the list of items (given in Table 1) as a set of items measuring the need for sense-making and used it in subsequent studies.

Study S1

In Study S1, we tested the structure of the need for sense-making. We conducted exploratory factor analysis verifying the unidimensional structure of the Need for Sense-Making Scale online on a sample of Polish students.

Method

Participants and Recruitment. Based on Mundfrom, Shaw, and Lu Ke (2009), who recommend that the sample size for factor analysis is from 3 to 20 times larger than the number of items, we aimed at conducting the study with as many participants as possible

within a set period of time with a minimum of at least 500 participants. Participants were 609 university students in Poland who completed an online study (515 women, 88 men). The age of the students ranged between 18 and 58 (M_{age} = 26.79, SD_{age} = 8.63). Participants received course credit points for participation.

Procedure and Materials. After giving their informed consent, participants completed the 29-item Need for Sense-Making Scale. We then gathered demographic data.

Results and Discussion

We performed an exploratory factor analysis (EFA) on the 29 items. The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis, *KMO* = .93, which is considered good. Bartlett's test for sphericity indicated sufficient correlations between items for EFA, $\chi^2(406) = 8174.66$, $p < .001$. Extracted eigenvalues indicated one main factor that explained 32.58% of variance. We used Cattell's criterion and change in explained variance to assess the number of factors. The scree plot suggested that a one-factorial solution was appropriate. The factor loadings are presented in Table S2. Additionally, the second factor added only 7.24% of variance. When we looked at the factor loadings for the rotated solution (using Quartimax rotation), we noticed that only three items were loading solely on the second factor.

Table S2

*Factor loadings based on exploratory factor analysis for 29 items of the Need for Sense-Making Scale (*N = *609*)

	Need for sense-making
1. I like it when I stop feeling bored	.36
2. I often get engaged in meaningful activities	.47
3. When I'm in a new situation I can't avoid searching for meaning in it	.48
4. When I can't make sense of a situation I usually feel upset	.46
5. When I do something that is meaningless I feel bad	.56
6. When I do something that is meaningful I feel good	.38
7. When I can't find the purpose of a situation it's unpleasant	.68
8. Even if a new situation is of little importance I would still try to find the purpose of it	.45
9. I don't like to feel bored	.43
10. I prefer to do things that are meaningful	.70
11. When I am in a new situation I try to find meaning in it	.72
12. When I make sense of a situation it is pleasant to me	.70
13. Usually, when I do something that is meaningless I want to switch to something else	.66
14. Usually, when I encounter an unclear situation I try to make sense of it	.64
15. When I feel bored I quickly try to do something to change it	.59
16. When things have no meaning it doesn't bother me at all	.52
17. I don't pursue purposeful activities	.45
18. I search for activities that serve a purpose	.70
19. I often engage myself in making sense of different situations	.71
20. I tend to search for the meaning of unclear situations until I find it	.66
21. I don't mind feeling bored	.43
22. I avoid situations that make no sense	.72
23. I don't like it when things serve no purpose	.65
24. I don't usually try to find the purpose of things	.24
25. Doing pointless activities doesn't bother me	.53
26. When I'm in an unexpected situation, the first thing that I want to do is to find meaning in it	.58
27. When I evaluate an activity as pointless I lose interest in doing it	.56
28. I often wonder what the relationships are between things	.57
29. I avoid doing boring things	.55

Note. Reverse coded items are in bold.

Study S2

The aim of Study S2 was to check for language equivalence of the English version of the Need for Sense-Making Scale relative to the original Polish version amongst participants fluent in both languages. Consistency in two languages would bolster confidence in the

assumption that the scale is not restricted to one particular language. After creating an accurate English translation (following a translation then back-translation procedure), we presented them to bilingual participants who completed both scales.

Method

Participants and Recruitment. Participants residing in Poland and fluent in both Polish and English took part in the study. Of the 36 participants that completed the study, four declared that their knowledge of English was intermediate or lower. We excluded their results from further analysis. The analyzed sample consisted of 32 participants, 21 women and 11 men (M_{age} = 28.56, SD_{age} = 6.43). Most of the participants declared having a higher education (63%), while the rest of the sample had completed secondary education (37%). Participation in the study was not compensated. The overall sample size yields corresponding power in excess of $(1 - \beta) = .80$, for lower and upper critical r of .35 ($\alpha = .05$, two-tailed).

Procedure and Materials. The 29-item scale was translated to English by a psychologist fluent in English and Polish, then back translated to Polish (by a different person, also fluent in English and Polish), then the original and back-translated Polish versions were compared by authors to verify the accuracy of the translation. Participants took part in an online study and completed the 29-item Need for Sense-Making Scale in two language versions—English and Polish. The order of the versions was counterbalanced. We asked for demographic data at the end of the study.

Results and Discussion

Both the English and Polish version of the scale had good reliability, $\alpha = .94$ and $\alpha = .96$, respectively. The correlation between the total scores of the two versions of the test was high, $r(32) = .89$, $p < .001$. Correlations between each pair of test items were satisfactory, ranging from, $r_s = .31$ to $r_s = .85$, ps $< .001$. The two language versions of the NSM were convergent. Mean scores in English (M = 5.34, SD = 0.88) and Polish (M = 5.45, SD = 0.88)

in NSM did not differ significantly from each other, $t(31) = 1.51$, $p = .142$. Results of this study gave initial support for the language invariance of the two versions of the Need for Sense-Making Scale.

Study S3

The aim of Study S3 was to analyze test-retest reliability of the Need for Sense-Making Scale. Specifically, we tested if people's scores on the NSM were relatively stable over a period of six weeks.

Method

Participants and Procedure. We gathered data from 48 Polish students (44 women, 4 men) $M_{age} = 25.88$, $SD = 8.24$, who completed the NSM twice with a break of six weeks between the two measurements. Participation was rewarded with course credit. We asked participants to complete the Need for Sense-Making Scale (we used twice the same instruction before administering NSM: 'Please indicate how much each of the following statements reflects how you typically are, using the scale provided') and to provide demographic data as part of other online studies. The overall sample size yielded corresponding power in excess of $(1 – \beta) = .80$, for lower and upper critical r of .28 ($\alpha = .05$, two-tailed).

Results

Internal consistency of the scale expressed as Cronbach's α for both measurements was high with Cronbach's $\alpha = .95$ for test and Cronbach's $\alpha = .94$ for retest. The test-retest reliability of the scale was also high, $r(48) = .81$, $p < .001$. Mean replies in NSM at time 1 ($M = 5.29$, $SD = 0.90$) did not differ significantly from replies at time 2 ($M = 5.29$, $SD = 0.87$), $t(47) = 0.11$, $p = .915$. These results indicate high test-retest reliability of the scale.

Study S4

The aim of Study S4 was to test whether the unifactorial structure of the Need for Sense-Making Scale was robust across cultures. We gathered Polish and English samples to test whether the factor structure was consistent across these two cultures. If so, this would further bolster our confidence in the structural stability of the NSM.

Method

Participants and Recruitment. Given the recommendations of Mundfrom, Shaw, and Lu Ke (2009) for confirmatory factor analysis, we wanted to conduct the study on as many participants as possible within a set period of time. Our sample consisted of 327 Polish and UK students. The Polish sample (N = 163; 131 women, 32 men; M_{age} = 28.92, SD_{age} = 8.14) was collected online; the UK sample (N = 164; 75 women, 89 men; M_{age} = 20.10, SD_{age} = 2.87) was collected via a paper-and-pencil survey. Participation in the study was not compensated.

Procedure and Materials. Participants reported demographic information and then completed the Need for Sense-Making Scale in Polish or English, respectively.

Results and Discussion

We tested if the one-factor model suggested by Study 1 and Study S1 replicated across the two languages and cultures, and checked for measurement invariance between these two samples. Prior to doing so, we replaced missing values (0.30% of all data) using a regression estimation method (e.g., Allison, 2001). A diagonally weighted least squares confirmatory factor analysis (CFA) on the combined sample yielded good fit $\chi^2/df = 1.88$, RMSEA = .052 (90% CI = [.046, .058]), GFI = .99, TLI = .96, CFI = .96, IFI = .96, SRMR = .08. Thus, the unifactorial model characterized the observed data in an appropriate (i.e., accurate yet parsimonious) way. We confirmed the unifactorial structure of the scale when we analysed the Polish and UK samples separately, yielding, fit $\chi^2/df = 1.32$, RMSEA = .045 (90% CI = [.033, .055]), GFI = .92, TLI = .96, CFI = .97, IFI = .97, SRMR = .098, and $\chi^2/df = 1.12$,

RMSEA = .029 (90% CI = [.00, .043]), GFI = .93, TLI = .99, CFI = .99, IFI = .99, SRMR = .091, respectively. All the regression weights were positive and indicated a moderate or strong relationship with the latent factor (Table S3).

Subsequent multiple-group analysis in which we compared the Polish sample against the UK sample further confirmed that, assuming the same unifactorial model for both cultures without any additional constraints, the results point to configural invariance, χ^2/df = 1.28, RMSEA = .042 (90% CI = [.034, .049]), GFI = .93, TLI = .97, CFI = .97, IFI = .97, SRMR = .094. The model with identical factor loadings across the samples fit well with the data, χ^2/df = 1.55, RMSEA = .056 (90% CI = [.052, .065]), GFI = .91, TLI = .94, CFI = .94, IFI = .94, SRMR = .106, but it was significantly different from the unconstrained model $\Delta\chi^2$/df = 8.51, $p < .557$, ΔCFI = 0.03, suggesting that the factor loadings differed across the two samples. The model assuming both identical factor loadings and identical variances of the latent factor and means also fit the data well χ^2/df = 1.67, RMSEA = .064 (90% CI = [.058, .070]), GFI = .99, TLI = .93, CFI = .93, IFI = .93, SRMR = .107; yet this model was significantly different from both unconstrained $\Delta\chi^2$/df = 6.71, $p < .001$, ΔCFI = 0.045, and from the model with identical factor loadings $\Delta\chi^2$/df = 4.84, $p < .001$, ΔCFI = 0.015, which shows that the two samples differed in terms of mean values and latent factor variances. Additionally, Cronbach's α of the 29-item scale reached Cronbach's α = .92 in the combined sample, Cronbach's α = .91 in the Polish sample, and Cronbach's α = .90 in the English sample. Polish respondents received higher scores on the NSM (M = 5.23, SD = 0.73), than British respondents (M = 4.59, SD = 0.76), $t(325) = 7.73$, $p < .001$, d = 0.86.

Table S3

Standardized factor loadings for the 29 items of the Need for Sense-Making Scale. The table presents results for the British (N = 164), Polish (N = 163) and the joint sample (N = 327), Study S4.

	British Sample			Polish Sample			British and Polish		
	Factor Loadings	*M*	*SD*	Factor Loadings	*M*	*SD*	Factor Loadings	*M*	*SD*
11. When I am in a new situation I try to find meaning in it	.699	4.42	1.49	.734	5.25	1.22	.749	4.82	1.43
13. Usually, when I do something that is meaningless I want to switch to something else	.696	4.23	1.58	.609	5.33	1.46	.703	4.78	1.61
07. When I can't find the purpose of a situation it's unpleasant	.689	3.99	1.56	.483	4.99	1.59	.563	4.48	1.65
20. I tend to search for the meaning of unclear situations until I find it	.671	4.21	1.42	.588	4.71	1.28	.654	4.46	1.37
08. Even if a new situation is of little importance I would still try to find the purpose of it	.648	3.85	1.59	.382	4.59	1.44	.220	4.22	1.55
19. I often engage myself in making sense of different situations	.639	4.66	1.30	.756	5.34	1.31	.692	5.00	1.35
26. When I'm in an unexpected situation, the first thing that I want to do is to find meaning in it	.613	3.82	1.42	.515	4.29	1.33	.597	4.06	1.40
18. I search for activities that serve a purpose	.591	4.81	1.40	.755	5.61	1.12	.702	5.22	1.33
03. When I'm in a new situation I can't avoid searching for meaning in it	.578	4.25	1.60	.425	4.92	1.58	.542	4.58	1.62
05. When I do something that is meaningless I feel bad	.578	3.42	1.72	.527	5.37	1.69	.644	4.40	1.96
16. When things have no meaning it doesn't bother me at all	.552	4.18	1.62	.434	5.03	1.58	.573	4.60	1.65
14. Usually, when I encounter an unclear situation I try to make sense of it	.549	4.94	1.33	.518	5.35	1.21	.548	5.15	1.28
23. I don't like it when things serve no purpose	.545	4.20	1.58	.650	4.87	1.54	.634	4.54	1.59
10. I prefer to do things that are meaningful	.510	5.29	1.27	.690	5.96	1.04	.632	6.62	1.20
12. When I make sense of a situation it is pleasant to me	.510	5.09	1.15	.656	5.94	1.00	.626	5.51	1.16
25. Doing pointless activities doesn't bother me	.506	3.97	1.72	.518	4.95	1.64	.561	4.45	1.76
22. I avoid situations that make no sense	.492	3.92	1.58	.608	4.71	1.51	.609	4.31	1.60
24. I don't usually try to find the purpose of things	.481	4.43	1.55	.269	4.82	1.61	.394	4.63	1.59
29. I avoid doing boring things	.478	4.88	1.63	.435	5.31	1.42	.452	5.09	1.54
04. When I can't make sense of a situation I usually feel upset	.404	4.07	1.65	.455	4.95	1.35	.468	4.51	1.57
27. When I evaluate an activity as pointless I lose interest in doing it	.397	4.36	1.61	.589	4.89	1.44	.537	4.62	1.54
15. When I feel bored I quickly try to do something to change it	.395	4.72	1.53	.360	4.96	1.37	.344	4.83	1.45
28. I often wonder what the relationships are between things	.362	4.98	1.45	.485	5.39	1.23	.468	5.18	1.36
17. I don't pursue purposeful activities	.315	5.14	1.37	.468	5.44	1.45	.401	5.29	1.42
02. I often get engaged in meaningful activities	.312	4.90	1.34	.341	6.06	1.09	.400	5.47	1.35
21. I don't mind feeling bored	.306	4.55	1.79	.373	4.80	1.71	.310	4.68	1.75
09. I don't like to feel bored	.287	5.97	1.21	.340	5.69	1.41	.220	5.83	1.32
06. When I do something that is meaningful I feel good	.102	5.73	1.32	.380	6.21	1.19	.301	5.97	1.28
01. I like it when I stop feeling bored	.085	6.29	.93	.190	6.02	1.25	.080	6.16	1.11

The differences in the proportion of men and women in the two countries was significant, $\chi^2(1) = 42.07$, $p < .001$, $\varphi = .36$. Participants coming from the Polish sample (M = 28.92, SD = 8.14) were somewhat older than the UK (M = 20.10, SD = 2.87) participants, $t(325) = 13.09$, $p < .001$, $d = 1.45$. Due to these dissimilarities, we wanted to test whether the observed differences in NSM would hold constant when controlling for age and gender of participants. We checked if there were any differences in mean levels of need for sense-making between men and women in Poland and in the United Kingdom. We thus conducted an ANOVA analysis with country of residence and gender of participants as between subject variables on need for sense-making as an outcome variable. The results showed that Polish participants can be characterized by higher levels of the need, than the British participants, $F(1, 323) = 35.38$, $p < .001$, partial $\eta^2 = .10$. Though women (M = 5.05, SD = 0.81) had slightly higher results in need for sense-making than men (M = 4.68, SD = 0.76), these results were not statistically significant, $F(1, 323) = 3.42$, $p = .065$, partial $\eta^2 = .01$. Interaction between gender and country was not statistically significant, $F(1, 323) = 0.68$, $p = .409$, partial $\eta^2 < .01$[5].

This study gives initial support for the cultural configural invariance of the unidimensional structure of the Need for Sense-Making Scale. It also suggests that there is space to explore cross-cultural differences in the levels of the need for sense-making. Due to uneven distribution of men and women, we are careful with drawing conclusions on the

[5] We conducted also a covariance analysis to check whether mean differences between Poland and United Kingdom would hold similar when controlling for gender, country and additionally age of participants. Results showed that such a model was well fit to the data, $F(3, 323) = 21.10$, $p < .001$. Country (coded as UK=1, Poland = 0) was again a significant predictor of the need for sense-making, $b^* = -.34$, $t(323) = -5.18$, $p < .001$, while gender (coded as women = 1, men = 0) and age did not significantly differentiate need for sense-making, respectively $b^* = .09$, $t(323) = 1.66$, $p = .098$ for gender, and $b^* = 0.04$, $t(323) = 0.64$, $p = .523$ for age.

differences (or lack or thereof) in mean need for sense-making between male and female participants.

We found that the instrument for measuring individual differences in need for sense-making is invariant across two cultures as far as the structure of the scale is concerned, yet it differs with regards to factor score loadings and mean values. Interestingly, Polish respondents can be characterized by higher levels of need for sense-making than British participants. It seems an interesting next step to conduct multi-country cross-cultural studies to see if there are any relationships between cross-cultural differences in the levels of need for sense-making and well-established cultural dimensions like prevention vs. promotion (e.g., Higgins, 2000; Kurman & Hui, 2012) or collectivism vs. individualism (Hofstede, Hofstede, & Minkov, 2005). Broader cross-cultural research is required to expand on cultural differences in need for sense-making.

Study S5

In Study S5 we focused on constructs that represent forms of epistemic motivation (need for closure, need for cognition, preference for consistency) or meaning in life (searching for meaning in life and presence of meaning in life). Positive relations between need for sense-making and each of these five constructs would indicate convergent construct validity of the NMS score interpretation. Importantly, we anticipated only moderate associations between the need for sense-making and these constructs, demonstrating their relatedness but not interchangeableness.

Method

Participants and Recruitment. We aimed at maximizing the number of participants we could reach within the time period we had to conduct the study. Participants were 147 students from United Kingdom (M_{age} = 21.26, SD_{age} = 3.46), 69 women and 78 men who completed a paper-and-pencil questionnaire. Participation in the study was not compensated.

The overall sample size yields corresponding power in excess of $(1 - \beta) = .80$, for absolute *r* value of .16 ($\alpha = .05$, two-tailed).

Procedure and Materials. The 29-item Need for Sense-Making Scale ($\alpha = .92$) was administered to participants together with 18-item Preference for Consistency ($\alpha = .92$, e.g., *'I prefer to be around people whose reactions I can anticipate',* 1 = *strongly disagree*, 9 = *strongly agree*; Cialdini, Trost, & Newsom, 1995), 18-item Need for Cognition ($\alpha = .86$, e.g., '*I would prefer a task that is intellectual, difficult, and important to one that is somewhat important but does not require much thought',* -4 = *very strongly disagree,* +4 = *very strongly agree*; Cacioppo & Petty, 1982), 41-item Need for Cognitive Closure ($\alpha = .87$, e.g., '*I don't like situations that are uncertain*', 1 = *strongly disagree,* 6 = *strongly agree*; Webster & Kruglanski, 1994; Roets & Van Hiel, 2007) and the 10-item Meaning in Life Questionnaire (subscale searching for meaning, $\alpha = .89$, subscale presence of meaning $\alpha = .88$, e.g., '*I am always looking to find my life's purpose*', 1 = *absolutely untrue,* 7 = *absolutely true*; Steger, Frazier, Oishi, & Kaler, 2006). The order of the scales was varied using Latin-square rotation. We collected demographic data at the end of the study.

Results and Discussion

Descriptive statistics and correlations between need for sense-making and the related constructs were all significantly positive (Table S4).

Table S4
Descriptive Statistics and Multitrait-Multimethod Matrix for Study S5.

Variable	1	2	3	4	5	*M*	*SD*
1. Need for Sense-Making	-					4.71	0.84
2. Need for Cognition	.16*	-				1.16	1.05
3. Preference for Consistency	.41**	-.11	-			5.56	1.35
4. Presence of Meaning in Life	.27*	.20*	.21*	-		4.43	1.43
5. Search for Meaning in Life	.31**	-.06	.23*	-.12	-	4.28	1.48
6. Need for Closure	.25*	-.20*	.56**	.06	.13	3.71	0.52

Note. $N = 147$, $^*p < .05$, $^{**}p < .001$.

As expected, need for sense-making moderately correlated with preference for consistency and with search for meaning in life. There was a weak relation between need for sense-making and need for cognition, need for cognitive closure and presence of meaning in life. These results indicate the convergent validity of NSM: it relates positively to theoretically relevant constructs, but at the same time, the relatively modest relationship between the variables indicates that need for sense-making is sufficiently distinct.

Additional Analysis Study 2

We calculated Averaged Variance Extracted (AVE) for NSM and the other variables. To calculate average variance extracted we have first conducted EFA (principal axis solution), similar to Ching et al. (2020). Each of the scales were set a fixed, one extraction factor. The subscales of the Big Five were analyzed separately in EFA, each subscale was also set a one, fixed extraction factor. We used factor loadings to calculate AVE for each of the variables. The factor loadings were additionally saved as new variables using regression method. We next correlated the factor scores between NSM and the other variables and compared squared correlations of these factors to AVE of each of the variables.

Table S1

Discriminant validity results including AVE and squared correlation between the regression based estimates of factor scores of NSM and regression based estimates of factor scores of the other variables in Study 2.

Variable	AVE	Pearson correlations with NSM	Squared correlations with NSM
1. Need for Sense-Making	.33	-	-
2. Extroversion	.51	.14*	.02
3. Agreeableness	.47	.03	<.001
4. Conscientiousness	.55	.13*	.02
5. Neuroticism	.53	-.14*	.02
6. Openness	.26	.21**	.04
7. Sense of Control	.39	.12†	.01
8. Self-esteem	.51	.22***	.05
9. Need to Belong	.37	.03	<.001

Note. $^{\dagger}p = .067$, * $p < .05$, ** $p < .01$, ***$p < .001$

The results showed that squared correlations between the regression based estimates of factor scores of the measured variables are consistently lower than AVE for NSM, or indeed than the AVE of any other variables. This supports the notion that there is no overlap between the constructs.

Additional Analysis Study 3

We also calculated AVE for NSM (.38) and satisfaction with life (.58). The factors of the variables were related to each other at a trend level $r(152) = .16$, $p = .057$. Squared correlation between the latent factors was lower than AVE of each of the constructs $R^2 = .03$, which confirms discriminant validity of NSM.

Additional Analysis Study 4b

We calculated AVE for NSM (.32) and work engagement (.56). The factors of these variables were related to each other at a trend level $r(184) = .33$, $p < .001$. Squared correlation between the factors was again lower than AVE of each of the constructs ($R^2 = .11$), which corroborates on the previous findings indicating discriminant validity of NSM.

Additional Analysis Study S5

We next calculated AVE and correlations and squared correlations between the regression based estimates of factor scores of the variables measured in Study S5 in the same manner as described in the section Additional Analysis Study 2. The results are presented in Table S5.

Table S5
Discriminant validity results including AVE and squared correlation between the regression based estimates of factor scores of NSM and the these estimates of the other variables measured in Study S5.

Variable	AVE	Pearson correlations with NSM	Squared correlations with NSM
1. Need for Sense-Making	.29	-	-
2. Need for Cognition	.28	.17†	.03
3. Preference for Consistency	.40	.38***	.14
4. Presence of Meaning in Life	.61	.25**	.06
5. Search for Meaning in Life	.62	.36***	.13
6. Need for Closure	.18	.29**	.08

Note. †$p = .060$, * $p < .05$, ** $p < .01$, ***$p < .001$

Similar to Study 2, the results showed that squared correlations between the factors of the measured variables were lower than the AVE for NSM, and than the AVE of any other variables, which confirms discriminant validity.

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