Original Manuscript

Psychological Needs Satisfaction and Attachment to Natural Landscapes

Environment and Behavior
1–23

DOI: 10.1177/0013916520916255
journals.sagepub.com/home/eab
SAGE

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Abstract

Motivation has long been implicated as an antecedent to place attachment among recreationists. Research has framed this association around expectancy theory, suggesting that the realization of preferred modes of experience leads to a positive evaluation of a setting (i.e., attachment). In this study, we tested an alternative hypothesis rooted in self-determination theory, which purported that place attachment arises from the realization of human needs for autonomy, relatedness, and competence. We tested this hypothesis using structural equation modeling with data from a study of visitors to wilderness areas in the southeastern United States. Results support the proposition that perceptions of a landscape supporting autonomy, relatedness, and competence are associated with identification, dependence, and emotional connection with that landscape. Reframing the association between motivation and place attachment around psychological needs furthers the generalizability of results and highlights the importance of wilderness as a context for self-determined thought and behavior.

Keywords

place attachment, psychological needs satisfaction, intrinsic motivation, self-determination theory, wilderness

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Introduction

Place scholarship has occupied a prominent role in environmental psychology for decades (Lewicka, 2011). Despite the numerous epistemological traditions that have emerged from the various fields (Patterson & Williams, 2005; Trentelman, 2009), place researchers, generally speaking, seek to understand the cognitive–affective bonds that individuals and groups form with the social and physical spaces they occupy at multiple scales and levels of abstraction (Hidalgo & Hernandez, 2001). Although scholarship has untangled many of the antecedents and outcomes of place attachment, many questions remain. The question of how individuals develop attachments to specific landscapes, for instance, remains perplexing in an increasingly mobile world (Di Masso et al., 2019).

Several studies have linked place attachment and human well-being (for a review, see Scannell & Gifford, 2017a). This body of work suggests that individuals who develop attachments to place realize positive psychological outcomes, including enhanced perceived well-being, feelings of self-efficacy, and autonomy (Scannell & Gifford, 2017b). This association is particularly salient in the context of natural environments given their potential restorative qualities (Kaplan, 1995; Korpela & Hartig, 1996), and humans' innate tendency to affiliate with nature (Wilson, 1984). Another potential explanation that has yet to be identified in the literature is the role of intrinsic motivation (IM; Ryan & Deci, 2000) and the facilitation of psychological needs in the development of place attachment. IM has also been linked to psychological well-being and functioning across the life cycle, and its effects are culturally conserved (Deci et al., 2001). In fact, recent research suggests that its manifestation in brain function is biological and can be found in a number of mammal species, but is substantially more complex in humans (Di Domenico & Ryan, 2017).

In the U.S. context, the nation's extensive system of federal protected areas are settings of leisure for millions of visitors. For instance, the U.S. National Park Service estimated that 330 million visits were made to its jurisdictional units in 2017 alone (Ziesler & Singh, 2018). A key component of most social psychological definitions considers leisure to be composed of two related components: perceived freedom and IM (Walker et al., 2019). Natural landscapes provide an important context for supporting humans' spontaneous tendencies to be curious and interested, to seek out challenges, and to exercise and develop their skills and knowledge in the absence of extrinsic rewards (Di Domenico & Ryan, 2017). Four decades of research conducted by Deci et al. (2017) within the context of their self-determination theory (SDT) have illustrated that environments supportive of IM foster

enhanced learning, performance, creativity, optimal development, and psychological wellness.

Given the demonstrated potential for natural landscapes to support IM, autonomy, and agentic behavior, it is reasonable to hypothesize that interaction with these landscapes leads to attachment. Some preliminary evidence supports these associations (Anderson & Fulton, 2008; Budruk & Wilhelm Stanis, 2013; Kyle, Mowen, & Tarrant, 2004; van Riper et al., 2019), but this research has not framed the association around the tenets of theory underlying IM (i.e., SDT). Rather, these studies are loosely rooted in Vroom's (1964) and Lawler's (1973) expectancy theory and suggest that attachment arises from the perceived ability of place to provide for preferred recreational outcomes. The conspicuous absence of IM in the place literature is surprising given the demonstrated associations between place, human behavior, and the outcomes associated with opportunities to engage in intrinsically motived behavior in natural settings.

With this in mind, the purpose of this investigation was to test the relationship between IM and attachment to wilderness landscapes. Drawing on SDT (Deci & Ryan, 1985; Milyavskaya & Koestner, 2011; Ryan & Deci, 2000), we hypothesized that visitors' attachments to wilderness areas are a function of the ability of these settings to satisfy basic psychological needs for autonomy, competence, and relatedness. Natural landscapes afford opportunities for independent choice with limited social controls, the engagement of physically and mentally challenging activities, and interaction with significant others. These are criteria found to foment IM (Ryan, 1995) and, we argue, in part, underpin the development of place attachment. We treat place as a locus of attachment anchored in the social and physical context, and adopt a psychometric method of measurement (Williams & Vaske, 2003). This approach is in line with contemporary studies in environmental psychology that have conceptualized place attachment as an attitude (Anderson & Fulton, 2008; Budruk & Wilhelm Stanis, 2013; Jorgensen & Stedman, 2001; Kyle, Mowen, & Tarrant, 2004, Kyle, Graefe & Manning, 2005). We limit our review to the literature sharing this conceptualization but recognize that alternative methods (e.g., phenomenology) of understanding place exist.

Wilderness, in the context of this study, refers to public lands managed by the U.S. Forest Service, U.S. National Park Service, U.S. Fish and Wildlife Service, and the Bureau of Land Management, designated as "wilderness" under federal statute. Lands designated as wilderness under law are managed for different values than are other types of lands in the federal system (Cordell et al., 2005). These lands are characterized as having minimal amounts of built infrastructure, including roads, trails, and buildings; are generally geographically distant from population centers; have low amounts of light and

noise pollution; and receive lower rates of human visitation on average (Driver et al., 1987). These lands are also characterized as possessing, for the most part, intact ecological communities, or as the Wilderness Act itself states, they are ". . . recognized as an area where the earth and its community of life are untrammeled by man [*sic*]." However, regulations and social norms do limit some behaviors in the wilderness context. For instance, beliefs surrounding human impacts limit the consumptive and depreciative behaviors of visitors (van Riper et al., 2020), as do rules associated with plant, fish, and wildlife harvest, and interaction with cultural artifacts. That is, wilderness contexts in the United States may allow for the pursuit of self-determined behavior, but they are not entirely without social constraints, and may differ substantively in character from "wilderness" settings in other social, political, and institutional contexts.

Literature Review

SDT and psychological needs satisfaction. SDT is a meta-theory of human behavior first developed to understand IM and human psychological development (Ryan & Deci, 2000), and has been applied widely across the literature (Van den Broeck et al., 2016). The theory suggests that human behaviors are controlled by a variety of internal and external factors. These factors can be arranged along a continuum from 100% external behavioral control to 100% integrated behavioral regulation. A-motivation, or a lack of control over one's behavior, characterizes one extreme of this continua while self-regulation characterizes the other. Proponents of SDT further hypothesize that intrinsically motivated behaviors arise in contexts where three evolutionarily conserved human psychological needs are supported: autonomy, competence, and relatedness (Deci & Ryan, 2000; Ryan, 1995). The satisfaction of these needs is thought to support healthy psychological functioning and general well-being (Milyavskaya & Koestner, 2011; Reis et al., 2000; Ryan & Deci, 2000). Therefore, the social, physical, and institutional conditions that facilitate psychological needs satisfaction have received significant attention as a topic of research under the umbrella of SDT (Deci & Ryan, 1985; Van den Broeck et al., 2016), and are germane to our investigation of wilderness as one such context.

Autonomy ". . . concerns the processes through which an organism initiates, coordinates and governs its behavior" (Ryan et al., 1997, p. 706). That is, self-regulated, autonomous, behavior is not behavior that occurs in the absence of external influence, but rather integrates disparate psychological systems to produce a state of motivation that facilitates goal achievement, need satisfaction, and, ultimately, well-being. Although the likelihood for the internalization of behavioral regulation increases in the absence of controls

(Deci et al., 1994), it is the perception of choice that governs feelings of autonomy with positive psychological outcomes. Experiencing autonomy does not preclude social interaction, it is merely the perception that one possesses agency in choosing to undertake a given behavior that supports feelings of autonomy (Van den Broeck et al., 2016).

Competence refers to a need to experience challenge and efficacy in one's pursuits. Similar to Bandura's (2001) social cognitive theory, the need for competence, or mastery over one's environment, is recognized as a universal human tendency. Humans must perceive that they have agency and can affect change in the world to experience optimal psychological functioning and well-being. Competence is a reflection of this need.

Relatedness is a central component of IM. Ryan and Deci (2000) suggest that

> . . . extrinsically motivated behaviors are not typically interesting, the primary reason people initially perform such actions is because the behaviors are prompted, modeled, or valued by significant others to whom they feel (or want to feel) attached or related. (p. 73)

Social relationships, therefore, are catalyst for IM, foster internalization, and are rooted in context (Ryan, 1991). Stated simply, humans have a need to feel connected to other humans (Baumeister & Leary, 1995). Contexts that facilitate human connections are contexts that may satisfy psychological needs and therefore foster IM. A summary of these constructs is presented in Table 1.

We argue that wilderness settings afford opportunities that facilitate the satisfaction of psychological needs. In support of this position, Ryan (1995), speaking about psychological needs and integrative processes that support well-being, offered the following:

> I propose that integrative processes are highly dependent upon contextual supports for basic psychological needs. Insofar as the nutriment relevant to psychological needs vary across contexts or domains, so too will the relative strength of integrative propensities, and one's experience of integrity and autonomy in functioning. (p. 399)

Stated another way, context is an important component in facilitating the satisfaction of psychological needs. We extend this to suggest that wilderness is a context that affords the necessary conditions for some. Attachment, therefore, is a product of wilderness' ability to fulfill the needs of some humans. One's attitude toward the physical world is a function of the attributes of the landscape and its ability to support human psychological needs.

Table 1. Basic Psychological Needs Definition and Relevant Citations.

Need	Definition	Relevant citations
Autonomy	Need to feel that one is the origin of their own actions, or that ". . . behavior is volitional and reflectively self-endorsed" (Niemiec & Ryan, 2009, p. 135)	Niemiec and Ryan (2009) Hackman and Oldham (1976) Deci and Ryan (2000)
Competence	Need to feel that one possess the capability to undertake a particular behavior in the present, or to exhibit mastery over their environment to achieve specific outcomes	Deci and Ryan (2000) White (1959) Bandura (1977)
Relatedness	A need to experience meaningful relationships with other humans, or to experience a sense of communion	(aka "belongingness") Baumeister and Leary (1995)

Place attachment and motivation. A number of studies have examined the relationship between motivation and place attachment. The vast majority of these studies have treated place as an attitude, but have drawn on subjective expected utility theories to explain individuals' evaluations of natural areas. Kyle, Mowen & Tarrant (2004), for example, found that individuals' place-based motivations—also referred to as place preferences—were significant predictors of multiple forms of attachment, including identity, affect, and dependence. The authors suggested that because different landscapes, as a result of inherent physical qualities and embodied cultural and institutional attributes, offer an array of potential experiences for recreationists, attachment arises from interaction with that place over time and its relative ability to provide for individuals' preferred mode of experience. Anderson and Fulton (2008) found that hunters' and wildlife viewers' experience preferences mediated the relationship between their intensity of participation in wildlife-related recreation and attachment to protected areas. Budruk and Wilhelm Stanis (2013) suggested an opposite ordering of the place–motivation relationship following a test of multiple competing models. Guided by empirical evidence, these authors reported that place preferences, in the form of motivation, may be an outcome of attachment, not an antecedent. Finally, van Riper et al. (2019) extended the motivation–place attachment relationship to demonstrate that an individual's environmental worldview influences their subjective perceptions of the qualities of a landscape, and ultimately the form of their attachment to it. These authors further suggested that IM and the

ability of places to satisfy psychological needs may play a role in the formation of place attachment. This proposition, however, remains untested.

Place attachment, well-being, and psychological needs. As far as we are aware, only one study (i.e., Scannell & Gifford, 2017a) has explored the relationship between place attachment, well-being, and psychological needs. In this study, the authors used an experimental design to prime participants with images of places of meaning and measured resultant contemporaneous levels of affect, belonging, self-esteem, and control. Findings suggested that values for these attributes increase after priming individuals with imagery associated with places of meaning. Beyond the experimental nature of the study, causal mechanisms underpinning the association are not fully articulated and derived from a variety of literatures. The results, however, clearly indicate that a relationship between psychological needs and place attachment exists.

These studies, and others, demonstrate a relationship between place attachment and place preferences, and place attachment and psychological needs but they fail to offer a sufficient theoretical explanation for how and why attachment arises. It may be that individuals' subjective evaluations of place attributes are related in some way to their forms of attachment. However, from a theoretical perspective, the ability of a place to afford opportunities for recreational activities is not in and of itself a sufficient quality to account for one's identification with it, among other forms of attachment. This is evidenced by the limited explanatory power of motivation, defined as one's subjective evaluation of place attributes, with respect to place attachment in previous studies (Anderson & Fulton, 2008; Budruk & Wilhelm Stanis, 2013; Kyle, Mowen, & Tarrant, 2004; van Riper et al., 2019). Drawing on SDT, and the work of Scannell and Gifford (2017a, 2017b), we propose that attachment arises from the ability of a place to provide for basic psychological needs, including autonomy, competence, and relatedness. That is, motivation arises from an inherent desire to fulfill these needs to the extent that they are perceived to be afforded by a setting. Attachment then reflects one's cognitive, affective, and conative evaluation of the setting. Although our hypothesis is functional in nature and, therefore, similar to previous studies examining the antecedents to place attachment, it differs with respect to the theory purporting to account for the formation of attachment. Accordingly, our operationalization of motivation is rooted in SDT's formative components: autonomy, competence, and relatedness. Rather than develop indicators that focus on the experiential outcomes afforded by landscape attributes, which is characteristic of past work, our operationalization employs indicators that directly capture autonomy, competence, and relatedness (Niven & Markland, 2016). Previous research has also suggested that symbolic meanings ascribed to

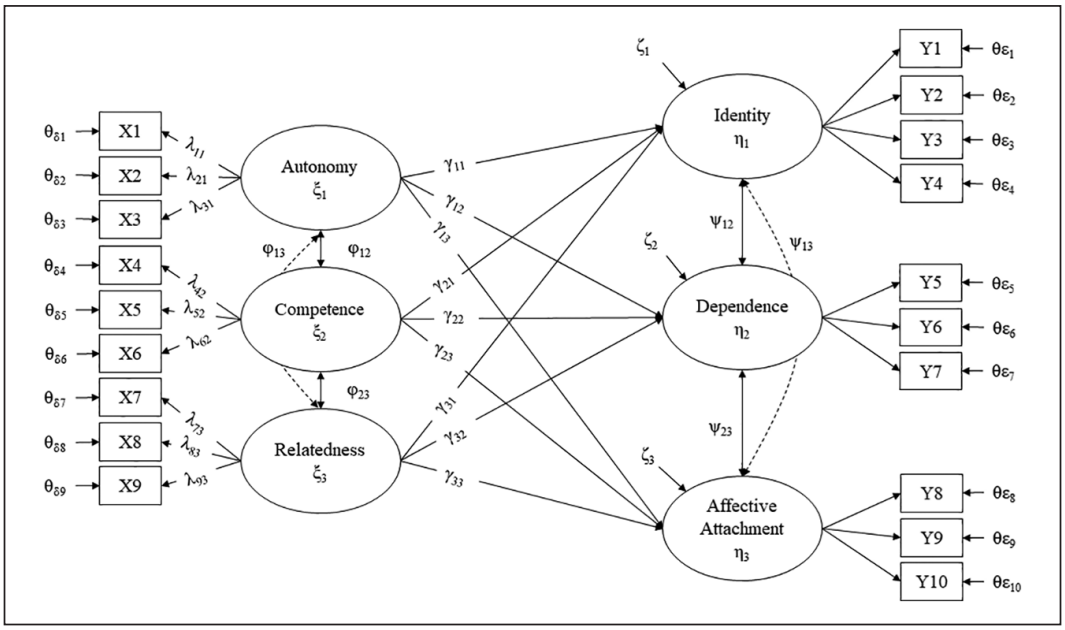

Figure 1. Hypothesized model of the relationship between psychological needs satisfaction and place attachment.

landscapes, in the form of place attachment, are a critical aspect of the value of wilderness (Williams et al., 1992). We further this thinking to suggest symbolic value is derived from the ability of landscapes to support the pursuit of self-determined thought and behavior, a critical component of humans' subjective well-being and psychological functioning.

Hypotheses. We hypothesized that perceptions of wilderness supporting opportunities for autonomy, competence, and relatedness would be positively associated with respondents' place identity, place dependence, and affective attachment to the wilderness setting. A graphical depiction of the hypothesized model, including the parameters that will be estimated, is presented in Figure 1.

Hypothesis 1 (H1): The perception that wilderness supports feelings of autonomy will be positively associated with place identity, affective attachment, and dependence.

Hypothesis 2 (H2): The perception that wilderness supports feelings of competence will be positively associated with place identity, affective attachment, and dependence.

Hypothesis 3 (H3): The perception that wilderness supports feelings of relatedness will be positively associated with place identity, affective attachment, and dependence.

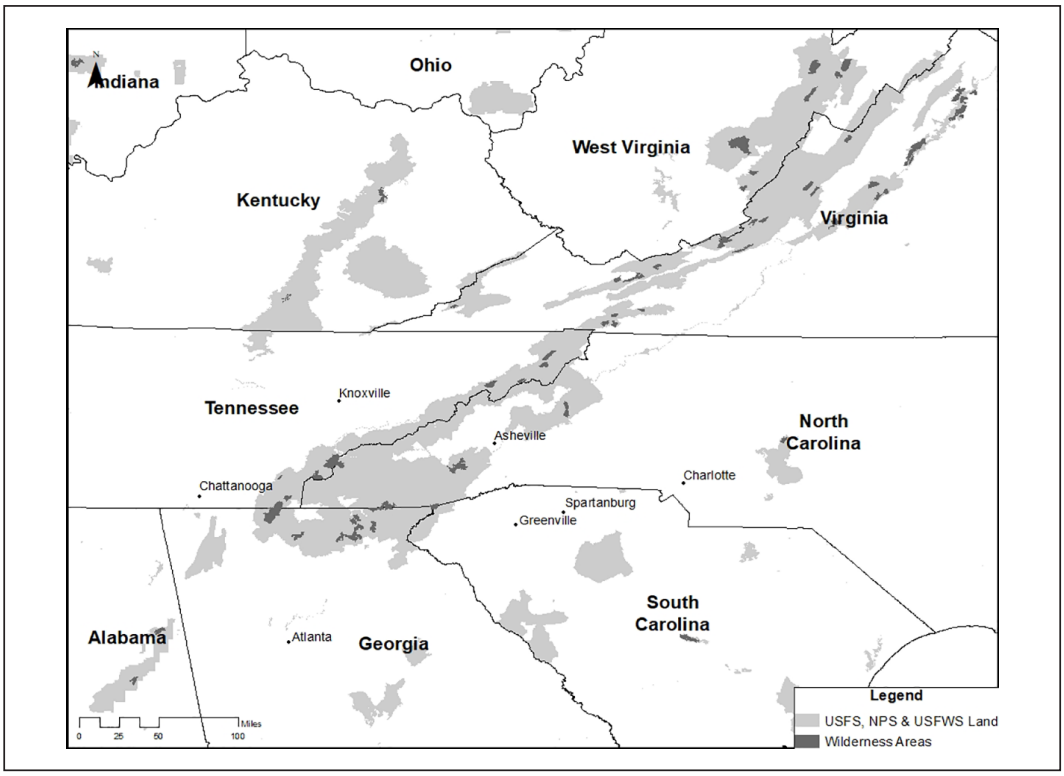

Figure 2. Map of the Southern Appalachian region.

Method

Data Collection and Study Context

Data were collected using a panel purchased from the survey firm, Qualtrics, during the summer of 2018. Participants were recruited if they were at least 18 years of age, lived in or adjacent to one of the six southern Appalachian metropolitan areas (Asheville, North Carolina; Atlanta, Georgia; Charlotte, North Carolina; Chattanooga, Tennessee; Greenville/Spartanburg, South Carolina; Knoxville, Tennessee), and had recently visited a protected natural area. See Figure 2 for a map of the study context. This resulted in a total sample of 1,250 participants. From those participants, a subsample was considered for this analysis that comprised 795 participants who had recently visited a wilderness area within the Southern Appalachian Region. A summary of respondent sociodemographic characteristic is presented in Table 2.

Measures

Three dimensions of psychological needs were operationalized using measures adapted from the scale developed by Niven and Markland (2016).

Table 2. Sociodemographic Profile of Sample ($N = 775$).

Sociodemographic variable	*n*	%
Gender		
Female	582	73.2
Male	207	26
Other	3	0.4
Prefer not to answer	3	0.4
Education		
Primary/elementary school	9	1.1
Secondary/high school certificate/diploma/GED	281	35.3
Technical, vocational or trade school	178	22.4
Four-year college (BA, BS, BFA)	203	25.5
Master's (MA, MS, MFA, MArch, MBA)	100	12.6
PhD/professional (MD, JD, DVM, DDM)	24	3
Race/ethnicity[a]		
White or Caucasian	680	85.5
Black or African American	108	13.6
American Indian or Alaska Native	16	2
Asian	15	1.9
Native Hawaiian or Pacific Islander	10	1.3
Hispanic/Latino	90	11.3
Political orientation		
Very liberal	57	7.2
Liberal	90	11.3
Slightly liberal	79	9.9
Neither liberal nor conservative	156	19.6
Slightly conservative	174	21.9
Conservative	150	18.9
Very conservative	89	11.2
Member of environmental/conservation group		
No	682	85.8
Yes	113	14.2

Note. GED = general educational development.
[a]Values do not sum to 100 due to multiple response option.

Psychological needs items were presented to participants after the stem, "considering a wilderness area that is most special to you, please indicate your agreement with the following . . ." Autonomy was measured with three items, including "I feel free to visit my special wilderness area in my own way." Competence was measured with three items, including "I feel that that

I am able to complete activities that challenge me when I visit my special wilderness area." Relatedness was also measured with three items, including "I feel connected to people who I interact with while I visit my special wilderness area."

We drew items from the scale developed by Kyle et al. (2005) to measure place attachment. This scale included three dimensions: place identity, affective attachment, and place dependence. Place identity is a cognitive appraisal of the extent to which a physical space is reflective of one's identity (Proshansky et al., 1983). Place identity was measured with four items, including "I identify with my special wilderness area." Affective attachment is an emotional connection to physical space (Kyle et al., 2005). Affective attachment was measured with three items, including "I feel a strong sense of belonging with my special wilderness area." Place dependence ". . . reflects the importance of a place in providing features and conditions that support specific goals or desired activities" (Williams & Vaske, 2003, p. 831). Place dependence was measured with three items, including "I cannot imagine a better place for the things I like to do than my special wilderness area." Place attachment items followed the same stem used for psychological needs. Participants recorded their responses to both psychological needs and place attachment measures on a 5-point bi-polar Likert-type scale where 1 = *strongly disagree*, 5 = *strongly agree*, and 3 = *neither*. All items used to measure psychological needs satisfaction and place attachment are presented in Table 3.

Analysis. A two-step approach was undertaken for latent variable modeling to test the generalized hypotheses depicted in Figure 1 (Anderson & Gerbing, 1988). In the first step, we tested a measurement model with covariances estimated between all pairs of latent constructs. This model was examined for overall fit, validity, and reliability. We considered the model adequate if it possessed values for the root mean square error of approximation (RMSEA) and the standardized root mean square residual (SRMR) $\leq .08$ (Hu & Bentler, 1999), and the comparative fit index (CFI) and nonnormed fit index (NNFI) $\geq .95$ (Hu & Bentler, 1999; Kline, 2016). We considered the constructs valid and reliable if the value for composite reliability exceeded .70 (Raykov, 1997), the average variance explained (AVE) by the construct was greater than .50 (Hair et al., 2014), and the factor loadings were significant with a standardized value greater than .40 (Brown, 2015). The Satorra and Bentler (SB) (1994) scaled chi-square statistic was used because the data were not multivariate-normal. After establishing construct validity, we estimated the full structural model according to Figure 1. The same criteria were used to evaluate the fit of the structural model. The measurement and structural

Table 3. Measurement Model Results.

Items and Constructs	*M* (*SD*)	λ (*SE*)*
Psychological needs satisfaction		
Autonomy: ρ = .83; AVE = .61		
I feel free to visit my special wilderness area in my own way (i.e., where, when, how)	4.1 (0.81)	.76 (0.02)
I feel free to make my own decisions when I visit my special wilderness area	4.0 (0.81)	.83 (0.02)
I feel like I am in charge of my own decisions when I visit my special wilderness area	4.0 (0.84)	.76 (0.02)
Competence: ρ = .90; AVE = .75		
I feel that I am able to complete activities that challenge me when I visit my special wilderness area	3.8 (0.89)	.85 (0.02)
I feel that I can do personally challenging activities when I visit my special wilderness Area	3.8 (0.91)	.89 (0.01)
I feel confident in my ability to perform activities that challenge me when I visit my special wilderness area	3.8 (0.88)	.86 (0.02)
Relatedness: ρ = .86; AVE = .66		
I feel like I share a common bond with people who are important to me when I visit my special wilderness area	3.8 (0.87)	.80 (0.02)
I feel connected to people who I interact with while we visit my special wilderness area	3.8 (0.87)	.85 (0.01)
I feel like I get along well with other people who I interact with while we visit my special wilderness area	3.9 (0.83)	.79 (0.02)
Place attachment		
Identity: ρ = .88; AVE = .68		
I identify with my special wilderness area	3.8 (0.90)	.76 (0.02)
I feel my special wilderness area is a part of me	3.7 (0.95)	.87 (0.01)
I feel that my identity is reflected in my special wilderness area	3.5 (1.00)	.86 (0.01)
Visiting my special wilderness area says a lot about who I am	3.6 (0.95)	.82 (0.01)
Dependence: ρ = .85; AVE =.66		
I cannot imagine a better place for the things I like to do than my special wilderness area	3.6 (1.01)	.82 (0.02)
My special wilderness area is the best place for the recreational activities that I enjoy	3.6 (0.93)	.80 (0.02)
I enjoy visiting my special wilderness area more than other areas	3.6 (0.95)	.81 (0.02)
Affective attachment: ρ = .87; AVE = .69		
My special wilderness area means a lot to me	3.9 (0.84)	.86 (0.02)
I really enjoy my special wilderness area	4.1 (0.77)	.77 (0.02)
I feel a strong sense of belonging with my special wilderness area	3.8 (0.91)	.85 (0.01)

Note. λ = standardized factor loading; ρ = composite reliability; AVE = average variance explained.
*All factor loadings statistically significant $p < .05$.

models were both estimated using the full information maximum likelihood (FIML) method to account for missing values. Finally, the statistical significance of parameter estimates was assessed at the 95% confidence level.

Results

We found the measurement model to be an adequate fit to the data (SB: $\chi^2_{SB} = 358.10$, $df = 136$, $p < .01$; $RMSEA_{SB} = .05$; SRMR = .03; $CFI_{SB} = .97$; $NNFI_{SB} = .96$). Values for composite reliability all exceeded .70, and the AVE was greater than .50. All standardized factor loadings were statistically significant and exceeded .40. After examining the model-derived modification indices, we made the decision to allow the items "I identify with my special wilderness area" and "I feel my special wilderness area is a part of me" to co-vary owing to a likely method effect associated with similarity in wording (Byrne et al., 1989). Measurement model results are summarized in Table 3.

Following the test of the measurement model, the structural model was also revealed to be an adequate fit for the data, according to the aforementioned criteria (SB: $\chi^2_{SB} = 358.10$, $df = 136$, $p < .01$; $RMSEA_{SB} = .05$; SRMR = .03; $CFI_{SB} = .97$; $NNFI_{SB} = .96$). Autonomy positively predicted place identity ($\gamma = .21$), place dependence ($\gamma = .26$), and affective attachment ($\gamma = .31$). Competence, like autonomy, positively predicted place identity ($\gamma = .18$), place dependence ($\gamma = .31$), and affective attachment ($\gamma = .28$). Finally, relatedness also predicted all three dimensions of place attachment: place identity ($\gamma = .36$), place dependence ($\gamma = .20$), affective attachment ($\gamma = .25$). The three dimensions of psychological needs satisfaction explained roughly half of the variance in place attachment dimensions ($R^2 = .49$–$.55$). Summaries of structural model results are presented in Table 4 and Figure 3.

Discussion

The aim of this study was to test the relationship between individuals' IMs for visiting wilderness areas and their attachments to such landscapes. Considering SDT (Milyavskaya & Koestner, 2011; Ryan & Deci, 2000), it was hypothesized that the attachments (i.e., place identity, place dependence, and affective attachment) recreationists have with wilderness areas are a function of the ability of those places to satisfy basic psychological needs for autonomy, competence, and relatedness. As such, three primary hypotheses were tested: autonomy (H1), competence (H2), and relatedness (H3) would each have a significant relationship with the three forms of attachment (i.e., place identity, place dependence, and affective attachment). Testing of the

Table 4. Structural Model Results.

DV ←	IV	γ (*SE*)	*z*-value	R^2
Identity	Autonomy	.21 (0.06)	3.38***	.50
	Competence	.26 (0.07)	4.00***	
	Relatedness	.31 (0.07)	4.40***	
Dependence	Autonomy	.18 (0.07)	2.57**	.49
	Competence	.31 (0.07)	4.69***	
	Relatedness	.28 (0.07)	4.16***	
Affective Attachment	Autonomy	.36 (0.07)	5.46***	.55
	Competence	.20 (0.06)	3.17***	
	Relatedness	.25 (0.07)	3.85***	

Note. DV = dependent variable; IV = independent variable.
**$p < .01$. ***$p < .001$.

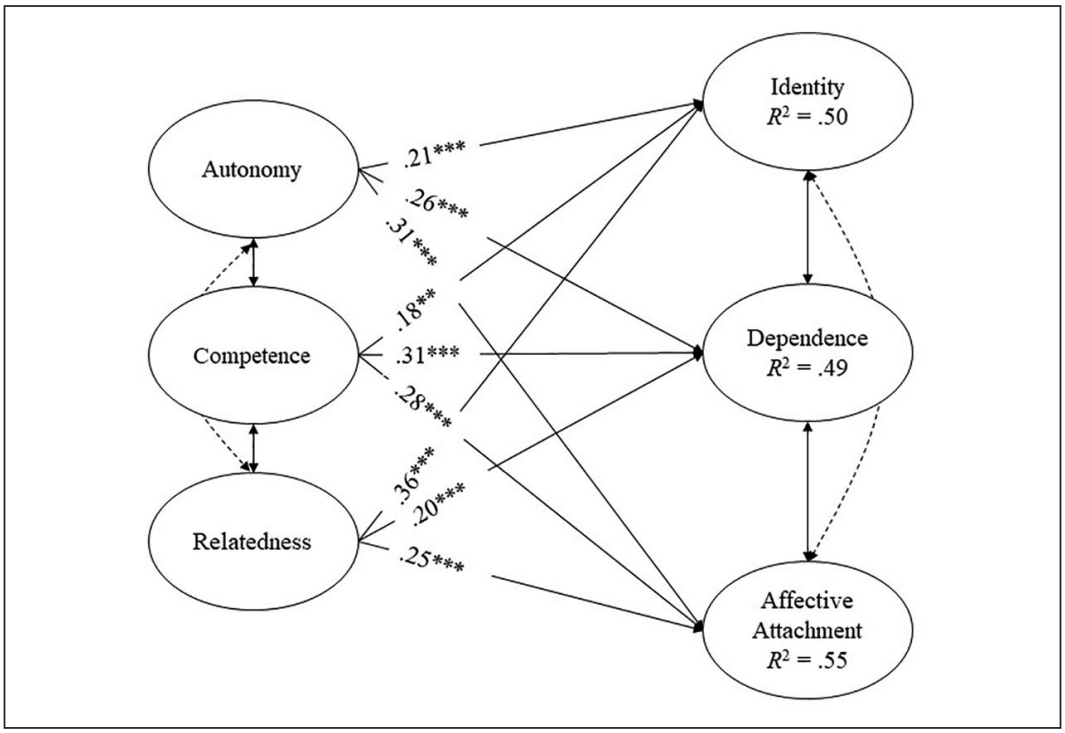

Figure 3. Summary of structural model results testing the relationship between psychological needs satisfaction and place attachment.
*$p < .01$. **$p < .05$. ***$p < .001$.

structural model revealed that psychological needs explained approximately half of the variance in each dimension of place attachment. Although no one clear psychological need construct stood out consistently as the best predictor

(based on γ and *z*-value estimates) of attachment, some noteworthy observations can be made. Focusing on the strongest predictors of each place dimension, place identity was most strongly associated with relatedness. At first glance, it might appear odd that wilderness experiences provide opportunity for relatedness in spite of visitors to these areas expressing strong preferences for solitude and privacy (Cole & Hall, 2008). However, given that U.S. wilderness experiences are often shared in the company of significant others (approximately two additional companions; Cole & Hall, 2008), coupled with the unique ethos that accompanies the intimate social world of backcountry wilderness recreationists (Fondren, 2016; Lum et al., 2020), it appears that these experiences support opportunities for relatedness that exist outside the "every-day" life experience of respondents. From a social identity perspective (Tajfel & Turner, 1979), these shared experiences provide an opportunity for the individual to embrace a place-based identity that contrasts with the roles and associated identities that consumers possess in their day-to-day lives (Stets & Burke, 2000). Our data do not reveal the attributes of these identities other than to suggest the perception that a place affords for an individual's need to affiliate with others' significantly girds the individuals' bond to that setting.

The relationship between competence and place dependence supports an extensive history of research illustrating the utility of place for satiating desired experiential outcomes (Anderson & Fulton, 2008; Budruk & Wilhelm Stanis, 2013; Kyle, Mowen & Tarrant, 2004; van Riper et al., 2019). Wilderness settings afford unique opportunities for the visitor. Public land management policy related to wilderness in the United States dictates these settings display little in the way of human encroachment. To derive enjoyment from these opportunities which are afforded by the landscape, the visitor must be in possession of competencies that enable them to navigate (literally) these settings without being overwhelmed. European settlement on the North American continent has depleted opportunities to access wilderness. Given the scarcity of wilderness contexts, and the limited opportunity to hone wilderness skills, the need for competence underlies respondents' dependence on the environment.

Last, respondents' emotional attachment to wilderness was most strongly associated with the perceived ability of the setting to provide for autonomy. As discussed previously, visits to wilderness occur in the context of leisure. Central to contemporary definitions of leisure is the need for perceived freedom and IM (Walker et al., 2019). The influence of nature-based leisure experiences on recreationists' emotional attachments to natural environments has been well documented in the literature (Bricker & Kerstetter, 2000; Kyle

et al., 2003, 2004; Moore & Graefe, 1994). Our findings align with this past work.

Despite the extant literature demonstrating limited explanatory power of motivations on place attachment, comparisons can be drawn with findings from our study. Budruk and Wilhelm Stanis (2013) found that none of the six dimensions of motivation (i.e., learn, escape, teach, nature, introspection, and similar) they tested significantly explained place attachment. Most recently, van Riper et al. (2019) revealed that five motivation factors (i.e., achievement, similar people, learning, enjoying nature, and escape) explained between 8% and 10% of the variance in placement attachment dimensions, with achievement serving as the strongest predictor. Such a finding is supported by work which revealed competence (a similar factor) to be one of the most consistent predictors in the models. Although achievement failed to explain place attachment factors in Anderson and Fulton's (2008) work, six motivation factors (i.e., autonomy, escape family, teach-lead others, creativity, learning, and introspection) explained a modest (3%–10%) amount of the variance in place attachment factors. Likely the most comparable findings to our results are found in the work of Kyle, Mowen and Tarrant (2004). The authors demonstrated that six motivations (i.e., health, autonomy, nature, learn, social, and activity) explained between 16% and 48% of the variance in place attachment dimensions. Collectively considered, our study reveals significantly higher degrees of variance explained in attachment.

While little work has connected psychological needs satisfaction with place attachment, Scannell and Gifford (2017a) did consider the reverse relationship (as did Budruk & Wilhelm Stanis, 2013, with motivations in general). These authors found that ~15% of the variance in psychological needs was explained by a treatment where participants envisioned places of meaning. Running the risk of comparing the proverbial "apples to oranges" between Scannell and Gifford's (2017b) study and ours, some contrasts can be noted. The authors relied on a convenience sample of college students and used a contrived experimental design, whereas our results are derived from a large, randomly selected sample of individuals who had recently visited a protected area and were from an entire region of the United States. Furthermore, only a marginal degree of variance was explained in Scannell and Gifford's model, whereas our model revealed that each of the psychological needs satisfaction factors explained approximately 50% of the variance in place attachment. However, this difference could be a function of the specificity of the attitude object in our independent and dependent measures.

SDT (Deci & Ryan, 1985, 2000; Ryan, 1995) provides a framework for understanding how different contexts yield different psychological outcomes. Place attachment, as conceptualized in this study, is the cognitive, affective,

and conative evaluation of wilderness settings in the southern Appalachian region of the United States. We hypothesized that a perception that one's object of attachment would facilitate the satisfaction of psychological needs was positively related to one's attitude toward that object, namely wilderness. Our findings confirmed this relationship. The relationship that we demonstrate has implications for practice, including the management of natural areas, and values important to natural resource stakeholders. Williams et al. (1992) challenged place scholars to look beyond the utilitarian attributes of nature to understand how and why people value the natural environment. Although the environmental psychology and recreation literatures have taken this challenge in stride, most studies have failed to offer a coherent psychological basis for the development of place attachment, an oft-cited transcendental value of natural landscapes. We propose that SDT is one such framework. Symbolic place meanings may be individually constructed, but they are rooted in a common human experience, and reflective of broad patterns of cognition and affect. Opportunities to fulfill needs for autonomy, relatedness, and competence, rather than preferences for settings and activities, as past studies have suggested, are the nutriments of attachment to nature. Wilderness landscapes afford a unique opportunity for self-regulated behaviors and, accordingly, warrant special consideration as places of value and protection.

The extent to which experience use history is related to perceptions of a setting's ability to satisfy psychological needs, and its subsequent effect on place attachment, remains unknown. Many studies have documented relationships between experience with a setting and the development of an attachment to it (Hernandez et al., 2007; Hidalgo & Hernandez, 2001; Twigger-Ross & Uzzell, 1996). It may be that with experience, individuals learn to exploit a setting to satisfy their needs, and this dynamic feeds their identification, dependence, and affection toward place. Demographic characteristics are also strongly associated with outdoor recreation participation (Lee et al., 2001), and the mode of expression of psychological needs likely varies across cultures (Deci & Ryan, 2000). While the needs for autonomy, competence, and relatedness are conserved across cultures (Chen et al., 2015), the experience of these needs is in part a function of culturally constructed values and norms. This may play a role in the interpretation of wilderness as a context conducive to needs satisfaction. In our opinion, these are questions that warrant further consideration.

This work is not without its limitations. Although psychological needs satisfaction explained a meaningful amount of variance in place attachment, the model only tested a single relationship (psychological needs $\rightarrow$ attachment). While this was our intention, room exists for improving the model

(i.e., increasing variance explained in place attachment) by including other theoretically derived predictor constructs of place attachment along with psychological needs satisfaction. For instance, environmental worldview (van Riper et al., 2019) or place of residence (i.e., living near threatened places; Anton & Lawrence, 2014) may be added to subsequent models explaining place attachment. In addition, place attachment could also be considered a mediator of the relationship between psychological needs satisfaction and some behavioral intention measure such as civic engagement (Stefaniak et al., 2017), environmental activist behavior (Schmitt et al., 2019), or community participation (Anton & Lawrence, 2014) directed toward assisting in the preservation of wilderness areas. Another limitation is that the population for this study only involved one region within the United States. Deriving a sample from a larger population (e.g., national U.S. or other country-wide population) may further validate our findings and improve the generalizability of the results. Although the data provided evidence in favor of the plausibly of our theoretically informed hypotheses, we encourage others to refine and extend this model to further validate the application of SDT to understand the development of place attachment.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: This work was supported by a grant from the Wilderness Society, and The Southern Environmental Law Center.

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