

# Empathy Mediates the Relationship between Nature Connectedness and Both Callous and Uncaring Traits

D. Fido and M. Richardson

Human Sciences Research Centre, University of Derby, Derby, UK.

## Abstract

*Across the world and time, humans share an innate affinity with nature. In addition to its benefits for mental well-being, the psychological construct of nature connectedness has been associated with several psychopathy-relevant traits including agreeableness, perspective-taking, and empathic concern. This study is the first of its kind to investigate whether nature connectedness is associated with indices of psychopathy, specifically, and whether these associations are further mediated by individual variation in cognitive and affective empathy—traits long considered to be deficient in psychopathy. One hundred and ninety-five participants completed an online survey whereby they were asked to self-report nature connectedness, empathy, and callous, uncaring, and unemotional traits—proxy measures for the affective component of psychopathy in community samples. Nature connectedness was positively associated with cognitive and affective empathy and inversely associated with callous and uncaring, but not unemotional, facets of personality. Furthermore, whereas cognitive empathy mediated the relationship between nature connectedness and both callous and uncaring traits, affective empathy only mediated the relationship between nature connectedness and callous traits. These findings provide evidence that broadens our understanding of the potential benefits of nature connectedness in general, and how subsequently increasing one's nature connectedness and associated ability to take the perspective of another might impact psychopathy, more specifically. As such, this study establishes the groundwork for future investigation and intervention in forensic populations.* Key Words:

Nature connectedness—Callous-unemotional traits—Cognitive empathy—Affective empathy—Psychopathy.

## 1. Introduction

In an age where fast-paced, modern lifestyles contribute to a reduction in the time children and adults spend outdoors (Bratman, Hamilton, & Daily, 2012; Clements, 2004; MacKerron & Mourato, 2013), our innate need for connection with the natural world (Wilson, 1984) is becoming increasingly strained (Nisbet & Zelenski, 2013a). Exposure to nature is associated with a range of health benefits (see Sandifer, Sutton-Grier, & Ward, 2015, for a review), so it is unsurprising that emerging research in this field has sought to promote engagement with nature through evidencing its relationship to psychological well-being (Nisbet & Zelenski, 2013a).

Often discussed using terms such as connectedness to nature (Mayer & Frantz, 2004), relatedness to nature (Nisbet, Zelenski, & Murphy, 2009), and inclusion of nature in oneself (Schultz, 2001), nature connectedness represents an underlying trait thought to encapsulate individual variation in the way in which people cognitively and affectively construct their interconnectedness with the natural world (Capaldi, Dopko, & Zelenski, 2014; Nisbet et al., 2009; Schultz, 2002). Nature connectedness is thought to vary along a continuum (Mayer & Frantz, 2004), and although considered stable across time (Nisbet et al., 2009), has proved malleable through intervention (Richardson, Cormack, McRobert, & Underhill, 2016; Richardson & Sheffield, 2017).

Nature connectedness is emerging as an independent predictor of well-being, with a range of benefits related to feeling good and functioning well, such as vitality (Kaplan, 1995; Ryan et al., 2010), happiness (Capaldi et al., 2014; MacKerron & Mourato, 2013), improved body image (Swami, Barron, Weis, & Furnham, 2016), and reduced anxiety (Martyn & Brymer, 2016); but see Richardson et al.

## FIDO AND RICHARDSON

(2017) for a review. Moreover, nature connectedness has been positively associated with agreeableness, perspective-taking, and empathic concern (Zhang, Piff, Iyer, Koleva, & Keltner, 2014), a series of traits arguably deficient in the developmental disorder psychopathy (Lynam & Derefinko, 2006). This indicates that the natural environment, and human connection to it, may have relevance to the development and/or potential treatment of psychopathy—an area not previously considered.

Psychopathy is thought to manifest in less than 1% of the population (Hare, 2003), which nevertheless places a substantial economic and emotional burden on society (Anderson & Kiehl, 2012; DeLisi, Reidy, Heirigs, Tostlebe, & Vaughn, 2018). In the general population, psychopathy-related deficits in interpersonal, affective, and behavioral facets of personality are widely acknowledged (Dawel, O'Kearney, McKone, & Palermo, 2012). In particular, the interpersonal and affective components can be indexed on a continuum through variation in callous, uncaring, and unemotional (CU) traits (Frick, 2004). Whereas callous and uncaring traits are related to the interpersonal facet of psychopathy, as depicted by a lack of guilt, remorse, and empathic concern for others (Byrd, Kahn, & Pardini, 2013), unemotional traits are related to the affective facet of psychopathy, which encompasses shallow affect and sensation-seeking (Kimonis, Cross, Howard, & Donoghue, 2013). Together, CU traits impact peer relationships (Viding & McCrory, 2012) and predict severe expressions of aggression and antisocial behavior (Frick & White, 2008; Porter & Woodworth, 2006; Waller et al., 2016).

In general, individuals who score high on callous and uncaring, more so than unemotional traits, are characterized by pervasive deficits in empathy (Hodsoll, Lavie, & Viding, 2014; White, Gordon, & Guerra, 2015). Empathy is broadly defined as the understanding and sharing of another's emotional experience (Decety & Lamm, 2009; Pasalich, Dadds, & Hawes, 2014) and is typically discussed in the context of cognitive and affective dimensions (Davis, 1983; Decety, 2011). Whereas cognitive empathy refers to an understanding of, and the ability to predict, the emotional state of another through perspective-taking, affective empathy refers to the vicarious sharing of another's emotional responses (Reniers, Corcoran, Drake, Shryane, & Völlm, 2011).

Deficits in empathy are robustly associated with higher levels of CU traits (Muñoz, Qualter, & Padgett, 2011; Pardini, Lochman, & Frick, 2003). However, although this finding is consistently true for affective empathy, the relationship between CU traits and cognitive empathy is only present in some (Anastassiou-Hadjicharalambous, & Warden, 2008; Dadds et al., 2009; Murphy et al., 2018; Pasalich et al., 2014), but not all (Jones, Happé, Gilbert, Burnett, & Viding, 2010;

Schwenck et al., 2012; Waller et al., 2016), investigations. Samples in which deficits in cognitive empathy have been found include children with conduct disorder displaying low, but not high, levels of CU traits (Anastassiou-Hadjicharalambous & Warden, 2008) and children before, but not after, puberty (Dadds et al., 2009; Pasalich et al., 2014). Because social manipulation relies upon the ability to understand though not necessarily feel the emotions of others, it follows that intact cognitive empathy may benefit psychopathy. Given the purported capacity for individuals to learn and develop empathy (Cozolino, 2010; Dadds et al., 2009), it remains to be seen whether alterations in one's empathic response further mediate empathy-related (e.g., CU) traits.

Although psychopaths have previously been reported to show a preference for inner-city relative to rural living (Jonason, 2018), this is the first study to investigate associations between nature connectedness and psychopathy-related personality traits. Thus, the current study contributes knowledge to this field and makes a unique contribution to environmental psychology by exploring the relationships between self-perceived connection with nature and callous, uncaring, and unemotional traits within the general population. Nature connectedness was hypothesized to inversely associate with callous and uncaring, but not unemotional, traits and positively associate with both cognitive and affective empathy. We also consider cognitive and affective empathy as potential mediators of associations between nature connectedness and CU traits. As such, it was further hypothesized that affective, but not cognitive, empathy would mediate the relationships between nature connectedness and CU traits.

## 2. Methods

### 2.1. Participants

To determine our target sample size, we conducted an a priori power analysis using G\*Power (version 3.1.9.2). Assuming an anticipated medium effect size ( $f^2 = 0.15$ ) and a standard alpha level of .05, a minimum of 129 participants were required to have 95% power in our planned analyses. One-hundred and ninety-five participants (aged  $34.85 \pm 10.46$  years, 28.2% male) provided written informed consent after responding to an online advertisement. All participants were fluent in English, aged between 18 and 55 years, and were predominantly (95.4%) of UK nationality. Further, all participants were without current diagnosis of psychiatric or neurological disorder and without any criminal convictions.

### 2.2. Procedure and materials

This research was approved by a central university research ethics committee. Participants reported demographic information and

## NATURE CONNECTEDNESS AND CALLOUS/UNCARING TRAITS

completed an online battery of questionnaires comprising The Nature Relatedness Scale (NRS6; Nisbet & Zelenski, 2013b), the Inventory of Callous-Unemotional Traits (ICU; Frick, 2004), and the Questionnaire of Cognitive and Affective Empathy (QCAE; Reniers et al., 2011). In total, the questionnaires took less than 15 min to complete.

The NRS6 comprises 6 items that measure one's connectedness to nature using a 5-point scale (e.g., "I always think about how my actions affect the environment"), with responses ranging from *Disagree Strongly* to *Agree Strongly* (Cronbach's  $\alpha = .84$ ). The ICU comprises 24 items that assess the occurrence and intensity of CU traits using a 4-point scale from *Not at All True* to *Definitely True*. Callousness (e.g., "I do not care who I hurt to get what I want";  $\alpha = .55$ ), uncaring (e.g., "I try not to hurt others' feelings [reverse scored]";  $\alpha = .73$ ), and unemotional (e.g., "I hide my feelings from others";  $\alpha = .84$ ) subscales of the ICU are reported in this study. The QCAE comprises 31 items that measure cognitive (e.g., "I can tell if someone is masking their true emotion";  $\alpha = .92$ ) and affective (e.g., "I often get emotionally involved with my friends' problems";  $\alpha = .85$ ) empathy using a 4-point scale from *Strongly Disagree* to *Strongly Agree*. Higher scores on these measures are related to greater connectivity with nature, CU traits, and cognitive and affective empathy, respectively. Cronbach's  $\alpha$  scores are derived from this data set.

### 2.3. Statistical analysis

Pearson correlations were computed between the predictor variable (nature connectedness), the predicted variables (callousness, uncaring, and unemotional traits), and the mediator variables (cognitive and affective empathy). To determine whether there were any indirect effects of nature connectedness on CU traits, through cognitive and affective empathy, the PROCESS procedure was used to test parallel multiple mediation models (Hayes, 2013, model type 4).

## 3. Results

Means, standard deviations, and bivariate correlations for nature connectedness, CU traits, and cognitive and affective empathy are displayed in Table 1.

### 3.1. Effects of nature connectedness on callous-unemotional traits through empathy

Nature connectedness showed significant negative relationships with callous (Beta =  $-.16$ ,  $SE = .08$ ,  $p = .04$ ) and uncaring (Beta =  $-.22$ ,  $SE = .07$ ,  $p = .001$ ), but not unemotional (Beta =  $-.16$ ,  $SE = .07$ ,  $p = .08$ ), traits and significant positive relationships with both cognitive (Beta =  $.24$ ,  $SE = .07$ ,  $p = .002$ ) and affective (Beta =  $.24$ ,  $SE = .07$ ,  $p = .002$ ) scores of empathy. These findings indicate that

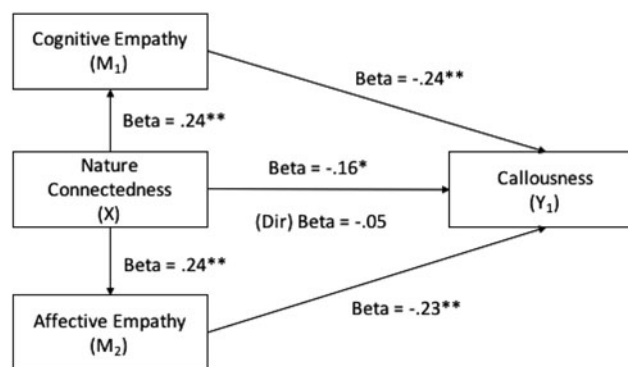
**Table 1. Intercorrelations, Means, and Standard Deviations for Psychometric Measures**

	M	SD	1	2	3	4	5	6
1 Nature Connectedness	3.69	0.89	-					
2 Callousness	4.96	3.17	-.16*	-				
3 Uncaring	6.20	3.56	-.22**	.30***	-			
4 Unemotional	6.83	3.55	-.12	.30***	.31***	-		
5 Cognitive Empathy	59.32	9.57	.24***	-.35***	-.35***	-.37***	-	
6 Affective Empathy	34.85	6.44	.24***	-.35***	-.25***	-.39***	.46***	-

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

individuals who are more connected to nature report lower callous and uncaring traits and higher degrees of cognitive and affective empathy.

In model 1 (see Fig. 1), cognitive (Beta =  $-.24$ ,  $SE = .07$ ,  $p = .002$ ) and affective (Beta =  $-.23$ ,  $SE = .07$ ,  $p = .001$ ) empathy were significantly associated with lower scores of callous traits, with the direct relationship between nature connectedness and callous traits rendered no longer significant (Beta =  $-.05$ ,  $SE = .07$ ,  $p = .54$ ). This finding suggests mediation by both cognitive and affective empathy (see Table 2). Assessing the significance of the indirect pathways, even though their independence could not be specified (Beta <  $-.01$ ,



**Fig. 1.** Parallel multiple mediation models of nature connectedness and its associations with callous traits, through cognitive and affective empathy ( $n = 195$ ; 5,000 resamples);  $p < .05^*$ ,  $p < .01^{**}$ .

FIDO AND RICHARDSON

**Table 2. Regression Coefficients, Standard Errors, and Summary Information for Parallel Multiple Mediation Models**

	COGNITIVE EMPATHY (M <sub>1</sub> )			AFFECTIVE EMPATHY (M <sub>2</sub> )			CALLOUSNESS (Y <sub>1</sub> )			UNCARING (Y <sub>2</sub> )			UNEMOTIONAL (Y <sub>3</sub> )		
	B	SE	p	B	SE	p	B	SE	p	B	SE	p	B	SE	p
Nature Connectedness (X)	2.54	0.75	<.001	1.70	0.51	<.001	-.16	.24	.51	-.51	.28	.07	.03	.27	.91
Cognitive Empathy (M <sub>1</sub> )	-	-	-	-	-	-	-.08	.02	<.001	-.10	.03	<.001	-.09	.03	.001
Affective Empathy (M <sub>2</sub> )	-	-	-	-	-	-	-.11	.04	.002	-.05	.04	.21	-.15	.04	<.001
Constant	49.94	2.85	<.001	28.28	1.92	<.001	14.11	1.52	<.001	16.04	1.73	<.001	17.34	1.68	<.001
	R <sup>2</sup> =0.06 F(1, 193)=11.43 p<.001			R <sup>2</sup> =0.06 F(1, 193)=11.31 p<.001			R <sup>2</sup> =0.17 F(3, 191)=13.08 p<.001			R <sup>2</sup> =0.15 F(3, 191)=11.19 p<.001			R <sup>2</sup> =0.20 F(3, 191)=15.51 p<.001		

X=Predictor Variable; M=Mediator Variable; Y=Outcome Variable.

SE=.04, 95% BcA CI=[-.07, .07]), the negative associations between callous traits and both cognitive (Beta=-.06, SE=.03, 95% BcA CI=[-.12, -.02]) and affective (Beta=-.05, SE=.02, 95% BcA CI=[-.11, -.02]) empathy were significant (5,000 bootstrap resamples).

In model 2 (see Fig. 2), cognitive (Beta=-.28, SE=.10, p<.01), but not affective (Beta=-.10, SE=.07, p=.19), empathy was significantly associated with lower scores of uncaring traits, with the direct relationship between nature connectedness and uncaring traits no longer significant (Beta=-.13, SE=.06, p=.52). This finding suggests the association between nature connectedness and uncaring traits was mediated by cognitive empathy (see Table 2). When assessing the significance of the indirect pathway, the negative association between uncaring traits and cognitive empathy (Beta=-.07,

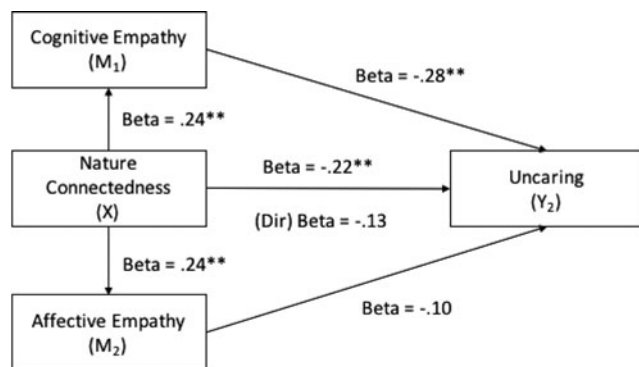
SE=.03, 95% BcA CI=[-.14, -.02]) was significant (5,000 bootstrap resamples).

**4. Discussion**

For the first time, this investigation has provided initial insight into the relationship between nature connectedness and psychopathy-related (e.g., CU) traits in the general population. Our hypotheses regarding links between nature connectedness and CU traits were supported. In line with predictions, a greater connectedness with nature was associated with lower scores on callous and uncaring, but not unemotional, traits. Furthermore, nature connectedness was positively associated with higher scores on measures of both cognitive and affective empathy. However, results of the mediation analyses were largely unexpected. Whereas cognitive empathy mediated relationships between nature connectedness and both callous and uncaring traits, affective empathy only mediated the former association.

Callous and uncaring traits lend themselves to the interpersonal dimension of psychopathy, and as such are associated with manipulative behaviors and a lack of guilt, remorse, and concern for others (Byrd et al., 2013). Recently, individuals scoring high on a measure of psychopathy have reported a preference for inner-city, relative to rural, living (Jonason, 2018). Although no measure of connectedness to nature was taken in that study, said findings likely represent the psychopath's attraction to residing in areas that suit their need for an exciting and fast-paced lifestyle (Jonason, Koenig, & Tost, 2010) as well as the provision of ample opportunity to mate, exploit, and mask their amoral and antisocial behavior (Jonason, 2018; Jonason, Foster, McCain, & Campbell, 2015; Jonason & Webster, 2012). It

F2



**Fig. 2.** Parallel multiple mediation models of nature connectedness and its associations with uncaring traits, through cognitive and affective empathy (n=195; 5,000 resamples); p<.05\*, p<.01\*\*.

## NATURE CONNECTEDNESS AND CALLOUS/UNCARING TRAITS

logically follows that individuals scoring high on psychopathy-related traits have a reduced connection with nature, which they may perceive as being boring and detrimental to obtaining exploitative social opportunities (Jonason, 2018). These findings align well with previous investigations denoting associations between nature connectedness and several psychopathy-relevant traits including agreeableness, perspective-taking, and empathic concern (Berenguer, 2007, 2010; Schultz, 2000; Zhang et al., 2014). The lack of an association between nature connectedness and unemotional traits in the current investigation was not surprising and likely indicates further delinquency-related disparity between the unemotional, and callous and uncaring subscales of the ICU (Byrd et al., 2013).

As expected, the inverse relationships between nature connectedness and callous and uncaring traits were mediated by higher self-reported empathy. Previously, increasing one's connection with nature has been associated with prosocial behavior (Zhang et al., 2014) and increased empathic concern for the biosphere as well as creatures within it (Berenguer, 2007; 2010; Schultz, 2000; Shelton & Rogers, 1981). However, with previous investigations predominantly relating exposure to nature with increases in nature-directed empathy, this investigation suggests comparable relationships between nature connectedness and human-directed empathy, or at least an underlying concept connecting the two.

Within the current literature, there exists some contradiction as to whether deficits in cognitive empathy do (Anastassiou-Hadjicharalambous & Warden, 2008; Dadds et al., 2009; Murphy et al., 2018; Pasalich et al., 2014) or do not (Jones et al., 2010; Schwenck et al., 2012; Waller et al., 2016) predict CU traits. Conceptually, intact cognitive empathy is necessary for manipulating others—a key characteristic of psychopathy (Hare, 2003)—yet results of this investigation evidenced inverse relationships between all three CU traits and both cognitive and affective dimensions of empathy. Regarding our mediation analyses, cognitive empathy mediated associations between nature connectedness and both callous and uncaring traits. These results are likely explained by previously identified associations between nature connectedness and perspective-taking (Zhang et al., 2014). The ability to understand the perspective of another is key for demonstrating cognitive empathy (Reniers et al., 2011), and as such, it is possible that individuals with greater levels of cognitive empathy are able to demonstrate greater care for others, as well as concern for the impact of their own behavior—especially in nonforensic samples such as the one described in this study. Elsewhere, perspective-taking has been identified as a core mediator between callous and uncaring traits, and reactive aggression (White et al., 2015)—a behavioral facet of psychopathy (Hare, 2003).

Interestingly, whereas deficits in affective empathy are thought to underpin the presence of CU traits (Blair, 2013), affective empathy in this investigation was only found to mediate the relationship between nature connectedness and callousness. Although affective empathy was inversely associated with CU traits through bivariate correlations, its absence of mediation in the relationship between nature connectedness and uncaring traits might be a function of the self-report measure of empathy used. A recent review by Murphy et al. (2018) suggests conceptual disparity between the QCAE used in this investigation and alternative measures of affective empathy such as the Interpersonal Reactivity Index (IRI; Davis, 1983) and the Affective and Cognitive Measure of Empathy (ACME; Vachon & Lynam, 2016). Specifically, the QCAE conceptualizes affective empathy in the absence of compassion and empathic concern and so posits that in order to emotionally resonate with another, one's emotional response must only be interpersonally appropriate, and not similar in form. Therefore, the absence of affective empathy-driven mediation between nature connectedness and uncaring traits might result from conflicting conceptualizations of affective empathy and so requires further investigation—potentially using alternate means.

### 4.1. Limitations

Limitations of this research and associated future avenues of investigation are discussed below. First, this study relied solely on self-reports of personality traits, some of which (e.g., CU traits) are not considered to be socially desirable and all of which were measured using only a single measure. Therefore, there is need to replicate these findings across comparable measures and populations, as well as to explore alternative means of capturing responses, examples of which might involve the use of vignettes to assess empathic ability (see Sethi, O'Nions, McCrory, Bird, & Viding, 2018) and implicit association tasks to index nature connectedness (see Schultz, Shriver, Tabanico, & Khazian, 2004). Moreover, we cannot rule out that connectedness in general, not nature connectedness specifically, is the driving force underpinning these associations, and so this should be controlled for in the future. Second, although good internal consistency (.70) for the callous subscale has been reported in a comparable sample elsewhere (Byrd et al., 2013), the Cronbach's  $\alpha$  reported in this investigation was reasonably low (.55). Therefore, interpretations of these results should be made with caution. Third, this investigation focused entirely on CU traits, a proxy measure for subclinical psychopathy. Psychopathy, though a distinct construct, overlaps with other nonpathological personalities such as Machiavellianism (i.e., a willingness to manipulate others to achieve one's

## FIDO AND RICHARDSON

own goals) and narcissism (i.e., a grandiose view of oneself), together referred to as the Dark Triad (Paulhus & Williams, 2002). Such traits have recently been shown to be higher in individuals favoring inner-city, relative to rural, living (Jonason, 2018), and as such represent a logical future step for investigation in relation to nature connectedness. Fourth, because of an unexpected disparity in the quantity of male and female responders, it was not possible to explore sex differences within this study, and as such generalizability of these findings is limited. This is an important consideration for future investigation as males typically report greater levels of psychopathic traits than females both in general and using the ICU specifically (Kimonis, Branch, Hagman, Graham, & Miller, 2013). Fifth, the authors acknowledge that although statistically significant and supported by a sufficient sample size, correlation coefficients between nature connectedness and other psychological traits were relatively low. Finally, causal relationships cannot be derived from this data. It remains to be seen whether reduced nature connectedness contributes to the development of atypical interpersonal and affective functioning, or whether psychopathy-related traits help reduce interconnectedness with nature. Despite these limitations, this study contributes to this emerging area of research and provides compelling evidence to suggest a role of nature connectedness in mediating deviant personality.

### 5. Conclusion

This study is the first investigation into the relationship between nature connectedness and psychopathy-related personality. The key finding of this research is that in addition to its benefits for general physical and mental well-being, an increased connection to nature is inversely related to callous and uncaring, but not unemotional, traits. Thus, if future research can identify a causal link between said traits, increasing nature connectedness through an intervention (e.g., the Three Good Things Nature Intervention; Richardson & Sheffield, 2017) may provide a cost- and resource-efficient means of protecting against the manifestation of costly psychopathy-related behavior. As such, the impact of this field of study is potentially far-reaching and could provide the basis for national and international policy changes. However, for now, the present study adds to academic knowledge and the growing body of evidence suggesting that nature connectedness is a desirable population trait with potential for societal impact.

### Author Disclosure Statement

The authors declared no potential competing interests with respect to the research, authorship, and/or publication of this article.

### Funding

This work received no financial support.

### Attribution

This work should be attributed to the University of Derby, Enterprise Centre, Bridge Street, Derby, DE1 3LD.

### REFERENCES

- Anastassiou-Hadjicharalambous, X., & Warden, D. A. (2008). Physiologically indexed and self-perceived affective empathy in conduct-disordered children high and low on callous-unemotional traits. *Child Psychiatry and Human Development, 39*, 503–517.
- Anderson, N. E., & Kiehl, K. A. (2012). The psychopath magnetized: Insights from brain imaging. *Trends in Cognitive Sciences, 16*, 52–60.
- Berenguer, J. (2007). The effect of empathy in proenvironmental attitudes and behaviors. *Environment and Behavior, 39*, 269–283.
- Berenguer, J. (2010). The effect of empathy in environmental moral reasoning. *Environment and Behavior, 42*, 110–134.
- Blair, R. J. R. (2013). Psychopathy: Cognitive and neural dysfunction. *Dialogues in Clinical Neuroscience, 15*, 181–190.
- Bratman, G. N., Hamilton, J. P., & Daily, G. C. (2012). The impacts of nature experience on human cognitive function and mental health. *Annals of the New York Academy of Sciences, 1249*, 118–136.
- Byrd, A. L., Kahn, R. E., & Pardini, D. A. (2013). A validation of the inventory of callous-unemotional traits in a community sample of young adult males. *Journal of Psychopathology and Behavioral Assessment, 35*, 20–34.
- Capaldi, C. A., Dopko, R. L., & Zelenski, J. M. (2014). The relationship between nature connectedness and happiness: A meta-analysis. *Frontiers in Psychology, 5*, doi:10.3389/fpsyg.2014.00976
- Clements, R. (2004). An investigation of the status of outdoor play. *Contemporary Issues in Early Childhood, 5*, 68–80.
- Cozolino, L. (2010). *The neuroscience of psychotherapy: Healing the social brain*. New York, NY: W. W. Norton & Company.
- Dadds, M. R., Hawes, D. J., Frost, A. D., Vassallo, S., Bunn, P., Hunter, K., & Merz, S. (2009). Learning to 'talk the talk': The relationship of psychopathic traits to deficits in empathy across childhood. *Journal of Child Psychology and Psychiatry, 50*, 599–606.
- Davis, M. H. (1983). Measuring individual differences in empathy: Evidence for a multidimensional approach. *Journal of Personality and Social Psychology, 44*, 113–126.
- Dawel, A., O'Kearney, R., McKone, E., & Palermo, R. (2012). Not just fear and sadness: Meta-analytic evidence of pervasive emotion recognition deficits for facial and vocal expressions in psychopathy. *Neuroscience and Biobehavioral Reviews, 36*, 2288–2304.
- Decety, J. (2011). The neuroevolution of empathy. *Annals of the New York Academy of Sciences, 1231*, 35–45.
- Decety, J., & Lamm, C. (2009). Empathy versus personal distress—Recent evidence from social neuroscience. In J. Decety & W. Ickes (Eds.), *The social neuroscience of empathy* (pp. 199–213). Cambridge, MA: MIT Press.
- DeLisi, M., Reidy, D. E., Heirigs, M. H., Tostlebe, J. J., & Vaughn, M. G. (2018). Psychopathic costs: A monetization study of the fiscal toll of psychopathy

## NATURE CONNECTEDNESS AND CALLOUS/UNCARING TRAITS

- features among institutionalized delinquents. *Journal of Criminal Psychology*, 8, 112–124.
- Frick, P. J. (2004). *The inventory of callous-unemotional traits* (Unpublished rating scale). University of New Orleans, New Orleans, LA.
- Frick, P. J., & White, S. F. (2008). Research review: The importance of callous unemotional traits for developmental models of aggressive and antisocial behaviour. *Journal of Child Psychology & Psychiatry*, 49, 359–375.
- Hare, R. D. (2003). *Hare psychopathy checklist-revised (PCL-R): Second edition, technical manual*. Toronto, Canada: Multi-Health Systems.
- Hayes, A. F. (2013). *Methodology in the social sciences. Introduction to mediation, moderation, and conditional process analysis: A regression-based approach*. New York, NY: Guilford Press.
- Hodsoll, S., Lavie, N., & Viding, E. (2014). Emotional attentional capture in children with conduct problems: The role of callous-unemotional traits. *Frontiers in Human Neuroscience*, 8, 1–7.
- Jonason, P. K. (2018). Bright lights, big city: The Dark Triad traits and geographical preference. *Personality and Individual Differences*, 132, 66–73.
- Jonason, P. K., Foster, J. D., McCain, J., & Campbell, W. K. (2015). Where birds flock to get together: The who, what, where, and why of mate searching. *Personality and Individual Differences*, 80, 76–84.
- Jonason, P. K., Koenig, B., & Tost, J. (2010). Living a fast life: The Dark Triad and Life History Theory. *Human Nature*, 21, 428–442.
- AU2 Jonason, P. K., & Webster, G. D. (2010). The Dirty Dozen: A concise measure of the Dark Triad. *Psychological Assessment*, 22, 420–432.
- Jones, A. P., Happé, F. G., Gilbert, F., Burnett, S., & Viding, E. (2010). Feeling, caring, knowing: Different types of empathy deficits in boys with psychopathic tendencies and autism spectrum disorder. *Journal of Child Psychology and Psychiatry*, 51, 1188–1197.
- Kaplan, S. (1995). The restorative benefits of nature: Toward an integrative framework. *Journal of Environmental Psychology*, 15, 169–182.
- Kimonis, E., Branch, J., Hagman, B., Graham, N., & Miller, C. (2013). The psychometric properties of the inventory of callous-unemotional traits in an undergraduate sample. *Psychological Assessment*, 25, 84–93.
- Kimonis, E. R., Cross, B., Howard, A., & Donoghue, K. (2013). Maternal care, maltreatment and callous-unemotional traits among urban male juvenile offenders. *Journal of Youth and Adolescence*, 42, 165–177.
- Lynam, D. R., & Derefinco, K. J. (2006). Psychopathy and personality. In C. J. Patrick (Ed.), *Handbook of psychopathy* (pp. 133–155). New York, NY: Guilford Press.
- MacKerron, G. & Mourato, S. (2013). Happiness is greater in natural environments. *Global Environmental Change*, 23, 992–1000.
- Martyn, P., & Brymer, E. (2016). The relationship between nature relatedness and anxiety. *Journal of Health Psychology*, 21, 1436–1445.
- Mayer, F. S., & Frantz, C. M. (2004). The Connectedness to Nature Scale: A measure of individuals' feeling in community with nature. *Journal of Environmental Psychology*, 24, 503–515.
- Muñoz, L. C., Qualter, P., & Padgett, G. (2011). Empathy and bullying: Exploring the influence of callous-unemotional traits. *Child Psychiatry and Human Development*, 42, 183–196.
- Murphy, B. A., Costello, T. H., Watts, A. L., Cheong, Y. F., Berg, J. M., & Lillienfeld, S. O. (2018). Strengths and weaknesses of two empathy measures: A comparison of the measurement precision, construct validity, and incremental validity of two multidimensional indices. *Assessment*. Advance online publication. doi:10.1177/1073191118777636
- Nisbet, E. K., & Zelenski, J. M. (2013a). Underestimating nearby nature: Affective forecasting errors obscure the happy path to sustainability. *Psychological Science*, 22, 1101–1106.
- Nisbet, E. K., & Zelenski, J. M. (2013b). The NR06: A new brief measure of nature relatedness. *Frontiers in Psychology*, 4, doi:10.3389/fpsyg.2013.00813
- Nisbet, E. K. L., Zelenski, J. M., and Murphy, S. A. (2009). The Nature Relatedness Scale: Linking individuals' connection with nature to environmental concern and behavior. *Environmental Behavior*, 41, 715–740.
- Pardini, D. A., Lochman, J. E., & Frick, P. J. (2003). Callous/unemotional traits and social-cognitive processes in adjudicated youths. *Journal of the American Academy of Child & Adolescent Psychiatry*, 42, 364–371.
- Pasalich, D. S., Dadds, M. R., & Hawes, D. J. (2014). Cognitive and affective empathy in children with conduct problems: Additive and interactive effects of callous-unemotional traits and autism spectrum disorders symptoms. *Psychiatry Research*, 219, 625–630.
- Paulhus, D. L., & Williams, K. M. (2002). The Dark Triad of personality: Narcissism, Machiavellianism, and psychopathy. *Journal of Research in Personality*, 36, 556–563.
- Porter, S., & Woodworth, M. (2006). Psychopathy and aggression. In C. J. Patrick (Ed.), *Handbook of psychopathy* (pp. 481–494). New York, NY: Guilford Press.
- Reniers, R. L. E. P., Corcoran, R., Drake, R., Shryane, N. M., & Völlm, B. A. (2011). The QCAE: A questionnaire of cognitive and affective empathy. *Journal of Personality Assessment*, 93, 84–95.
- Richardson, M., Cormack, A., McRobert, L., & Underhill, R. (2016). 30 days wild: Development and evaluation of a large-scale nature engagement campaign to improve well-being. *PLoS One*, 11, doi:10.1371/journal.pone.0149777
- Richardson, M., Maspero, M., Golightly, D., Sheffield, D., Staples, V., & Lumber, R. (2017). Nature: A new paradigm for wellbeing and ergonomics. *Ergonomics*, 60, 292–305.
- Richardson, M., & Sheffield, D. (2017). Three good things in nature: Noticing nearby nature brings sustained increases in connection with nature. *Psychology*, 8, 1–32.
- Ryan, R. M., Weinstein, N., Bernstein, J., Brown, K. W., Mistretta, L., & Gagné, M. (2010). Vitalizing effects of being outdoors and in nature. *Journal of Environmental Psychology*, 30, 159–168.
- Sandifer, P. A., Sutton-Grier, A. E., & Ward, B. P. (2015). Exploring connections among nature, biodiversity, ecosystem services, and human health and well-being: Opportunities to enhance health and biodiversity conservation. *Ecosystem Services*, 12, 1–15.
- Schultz, P. W. (2000). Empathizing with nature: The effects of perspective taking on concern for environmental issues. *Journal of Social Issues*, 56, 391–406.
- Schultz, P. W. (2001). Assessing the structure of environmental concern: Concern for the self, other people, and the biosphere. *Journal of Environmental Psychology*, 21, 327–339.
- Schultz, P. W. (2002). Inclusion with nature: The psychology of human-nature relations. In P. Schmuck & W. P. Schultz (Eds.), *Psychology of sustainable development* (pp. 61–78). Dordrecht, the Netherlands: Kluwer Academic Publishers.
- Schultz, P. W., Shriver, C., Tabanico, J. J., & Khazian, A. M. (2004). Implicit connections with nature. *Journal of Environmental Psychology*, 24, 31–42.
- Schwenck, C., Mergenthaler, J., Keller, K., Zech, J., Salehi, S., Taurines, R., ... Freitag, C. M. (2012). Empathy in children with autism and conduct disorder: Group-specific profiles and developmental aspects. *The Journal of Child Psychology and Psychiatry*, 53, 651–659.

## FIDO AND RICHARDSON

- Sethi, A., O'Nions, E., McCrory, E., Bird, G., & Viding, E. (2018). An fMRI investigation of empathic processing in boys with conduct problems and varying levels of callous-unemotional traits. *NeuroImage: Clinical, 18*, 298–304.
- Shelton, M. L., & Rogers, R. W. (1981). Fear-arousing and empathy-arousing appeals to help: The paths of persuasion. *Journal of Applied Social Psychology, 11*, 366–378.
- AU2 Sobel, D. (1996). *Beyond ecophobia: Reclaiming the heart of nature education*. Great Barrington, MA: The Orion Society.
- Swami, V., Barron, D., Weis, L., & Furnham, A. (2016). Bodies in nature: Associations between exposure to nature, connectedness to nature, and body image in US adults. *Body Image, 18*, 153–161.
- AU2 Tam, K. (2013). Dispositional empathy with nature. *Journal of Environmental Psychology, 35*, 92–104.
- AU2 Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology, 11*, 201–230.
- Vachon, D. D., & Lynam, D. R. (2016). Fixing the problem with empathy. *Assessment, 23*, 135–149.
- Viding, E., & McCrory, E. J. (2012). Genetic and neurocognitive contributions to the development of psychopathy. *Development and Psychopathology, 24*, 969–983.
- Waller, R., Dishion, T. J., Shaw, D. S., Gardner, F., Wilson, M. N., & Hyde, L. W. (2016). Does early childhood callous-unemotional behavior uniquely predict behavior problems or callous-unemotional behavior in late childhood? *Developmental Psychology, 52*, 1805–1819.
- White, B. A., Gordon, H., & Guerra, R. C. (2015). Callous-unemotional traits and empathy in proactive and reactive aggression in young women. *Personality and Individual Differences, 75*, 185–189.
- White, M. P., Alcock, I., Wheeler, B. W., & Depledge, M. H. (2013). Would you be happier living in a greener urban area? A fixed-effects analysis of panel data. *Psychological Science, 24*, 920–928.
- Wilson, E. O. (1984). *Biophilia*. Cambridge, MA: Harvard University Press.
- Zhang, J. W., Piff, P. K., Iyer, R., Koleva, S., & Keltner, D. (2014). An occasion for unselfing: Beautiful nature leads to prosociality. *Journal of Environmental Psychology, 37*, 61–72.

Address correspondence to:

Dr. Dean Fido  
University of Derby  
Enterprise Centre  
Bridge Street  
Derby, DE1 3LD  
UK

E-mail: d.fido@derby.ac.uk

Received: October 25, 2018

Accepted: February 4, 2019

AU1: Jonason & Webster (2012) is not found in the reference list. Please reconcile.

AU2: The following are not found in the text: Jonason & Webster (2010); Sobel (1996); Tam (2013); Ulrich et al. (1991); White, Alcock, Wheeler, & Depledge (2013). Please reconcile.