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Kinship intensity and the use of mental states in moral judgment across societies

Cameron M. Curtin[a,+], H. Clark Barrett[b,c], Alexander Bolyanatz[d], Alyssa Crittenden[e], Daniel M.T. Fessler[b,c,f], Simon Fitzpatrick[g], Michael Gurven[h], Martin Kanovsky[i], Geoff Kushnick[j], Stephen Laurence[k,l], Anne Pisor[h,m], Brooke Scelza[b,c], Stephen Stich[n,o], Chris von Rueden[p], Joseph Henrich[a]

[a] Department of Human Evolutionary Biology, Harvard University, 11 Divinity Ave, Cambridge, MA 02138

[b] Department of Anthropology, University of California, Los Angeles, CA 90095-1553

[c] Center for Behavior, Evolution, and Culture, University of California, Los Angeles, CA 90095-1553

[d] Social Sciences Subdivision, College of DuPage, Glen Ellyn, IL 60137-6599

[e] Department of Anthropology, University of Nevada, Las Vegas, NV 89154-5003

[f] Bedari Kindness Institute, University of California, Los Angeles, CA 90095-1553

[g] Philosophy Department, John Carroll University, University Heights, OH 44118

[h] Department of Anthropology, University of California, Santa Barbara, CA 93106-3210

[i] Institute of Social Anthropology, Faculty of Social and Economic Sciences, Comenius University, 820 05 Bratislava 25, Slovakia

[j] School of Archaeology and Anthropology, The Australian National University, Canberra ACT 0200, Australia

[k] Department of Philosophy, University of Sheffield, Sheffield S3 7QB, United Kingdom

[l] Hang Seng Centre for Cognitive Studies, University of Sheffield,

Sheffield S3 7QB, United Kingdom

[m] Department of Anthropology, Washington State University, Pullman, WA 99164-4910

[n] Department of Philosophy, Rutgers University, New Brunswick, NJ 08901-1107

[o] Center for Cognitive Science, Rutgers University, New Brunswick, NJ 08901-1107

[p] Jepson School of Leadership Studies, University of Richmond, Richmond, VA 23173

[+] Corresponding author: cameron_curtin@g.harvard.edu

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Abstract

Decades of research conducted in Western, Educated, Industrialized, Rich, & Democratic (WEIRD) societies have led many scholars to conclude that the use of mental states in moral judgment is a human cognitive universal, perhaps an adaptive strategy for selecting optimal social partners from a large pool of candidates. However, recent work from a more diverse array of societies suggests there may be important variation in how much people rely on mental states, with people in some societies judging accidental harms just as harshly as intentional ones. To explain this variation, we develop and test a novel cultural evolutionary theory proposing that the intensity of kin-based institutions will favor less attention to mental states when judging moral violations. First, to better illuminate the historical distribution of the use of intentions in moral judgment, we code and analyze anthropological observations from the Human Area Relations Files. This analysis shows that notions of strict liability—wherein the role for mental states is reduced—were common across diverse societies around the globe. Then, by expanding an existing vignette-based experimental dataset containing observations from 321 people in a diverse sample of 10 societies, we show that the intensity of a society's kin-based institutions can explain a substantial portion of the population-level variation in people's reliance on intentions in three different kinds of moral judgments. Together, these lines of evidence suggest that people's use of mental states has coevolved culturally to fit their local kin-based institutions. We suggest that although reliance on mental states has likely been a feature of moral judgment in human communities over historical and evolutionary time, the relational fluidity and weak kin ties of today's WEIRD societies position these populations' psychology at the extreme end of the global and historical spectrum.

Keywords

Moral judgment, mental states, theory of mind, kinship intensity, cultural evolution, WEIRD

> *Every murder, intentional or unintentional, calls for clan vengeance. The closest clansman of the murdered… must, in the figurative expression of the Gilyak, "raise up the kindred bones", i.e., kill the murderer or at least some person of the male sex of his khal' [clan]. And the wrath of vengeance is so great that not even newborn children are spared.*
>
> — Shternberg, Bromwich, & Ward (1933), among the Nivkh (Gilyak) hunter-gatherers of eastern Siberia

1. Introduction

For many readers, the above epigraph portrays a curious and almost counter-intuitive approach to moral judgment. Whether a death comes about through an intentional act of murder or is entirely accidental, the punishment is similarly harsh. This narrow focus on outcomes at the exclusion of intent contrasts with conceptions of culpability and responsibility common in many Western, industrialized societies today. The approach to guilt that many readers are familiar with, which began to develop in Western law during the Middle Ages, focuses primarily on inferences about the mental states of those involved (Berman, 1983; Harper, 2013; Henrich, forthcoming).

In recent decades, research on moral judgment among populations that are Western, Educated, Industrialized, Rich, and Democratic (WEIRD) has documented subjects' consistent tendency to heavily weight agents' mental states, and particularly their intentions, when assessing the moral permissibility and punishment-worthiness of actions. For example, WEIRD subjects judge *attempted* harms, which involve malicious intent but a neutral outcome, more harshly than *accidental* harms, which involve innocent intent but a negative outcome (Young, Cushman, Hauser, & Saxe, 2007; Young & Saxe, 2008, 2009). Although intent-based moral judgment has a complex developmental trajectory (Cushman, Sheketoff, Wharton, & Carey, 2013), some evidence indicates that even babies incorporate information about intent into their social decisions: given the choice, preverbal infants prefer a puppet who tried but failed to help a third party over a puppet who tried but failed to hinder a third party (Hamlin, 2013). These broad and replicable patterns (Cushman, 2015; Saxe, 2016; Young & Tsoi, 2013) suggest that the great importance of mental states in making moral judgments may be a reliably developing feature of human cognition that emerges with little input from cultural evolution. Considering others' mental states may serve as an adaptive strategy that helps individuals (1) pick the best cooperative partners, (2) avoid uncooperative or dangerous individuals (Chakroff et al., 2016; Young & Tsoi, 2013; Young & Waytz, 2013), (3) select and accurately learn from moral exemplars, or (4) punish and teach most effectively.

However, several recent studies reveal broad variation across societies in the manner and context in which people use mental states during moral judgment. In the largest cross-cultural study to date, Barrett et al. (2016) compared responses to moral-judgment vignettes featuring physical harm, poisoning, theft, and food taboo violations across ten societies. While participants from Los Angeles and rural Ukraine placed substantial weight on intentions in their judgments, pastoralists from Namibia and fisher-horticulturalists from Fiji deemed high- and low-intent harms across most domains to be equally bad, punishment-worthy, and reputation-damaging. Participants from the remaining six societies fell in between these extremes. Barrett et al. (2016) also found substantial variation in the degree to which potentially mitigating factors like self-

defense, insanity, and necessity altered the severity of moral judgments. Because taking a mitigating factor into account often requires consideration of a perpetrator's state of mind, this result further indicates population-level variation in the tendency to employ mental-state reasoning during moral judgment. Replicating the noteworthy patterns found in Fiji, McNamara et al. (2019) confirmed that indigenous Fijians place more focus on outcomes than intentions when judging moral scenarios, while still taking intentions into account to some degree, in certain situations (e.g. deeming attempted harms, which involve negative intent but neutral outcome, somewhat "bad"). Related patterns have also been detected in industrialized Asian societies. In contemporary Japan, participants weigh intentions less heavily than in the U.S. when making moral judgments, particularly in certain contexts (Hamilton & Sanders, 1992). Together, these results suggest that while some inclination to consider intentions during moral judgment in at least some situations has been found in all societies studied to date, WEIRD people, with their laser-like focus on mental states, seem to lie at the extreme end of the global distribution.

This curious pattern presents a puzzle: how can we explain the observed cross-cultural variation? Here, we develop and test a cultural evolutionary theory to answer this question, arguing that a substantial part of this variation can be explained by the strength of kin-based institutions, or *kinship intensity*.

We first lay out a theoretical framework to support the hypothesis that reliance on mental states during moral judgments should decrease with kinship intensity. Then, to set the scene for our analysis of cross-cultural experimental data (Barrett et al., 2016), we review the ethnographic evidence for norms that might suppress the use of mental states, specifically focusing on *opacity of mind* and *strict liability*. Contrary to WEIRD intuitions, such mental-state-disregarding norms are widespread. This suggests that, rather than highlighting a few peculiar societies, recent cross-cultural studies of the importance of mental states in moral judgment may be uncovering globally and historically important forms of psychological variation. Next, we provide empirical support for our hypothesis, showing that kinship intensity predicts the use of mental states during moral judgment across a diverse sample of ten societies. In closing, we suggest that although mentalizing has likely been a feature of moral judgment in many communities, the relational fluidity and weak social ties of today's WEIRD societies place this population's psychology at the extreme end of the global and historical spectrum.

2. Theoretical framework

Theory of mind, or the ability to infer others' beliefs, thoughts, goals, and desires, is likely a reliably developing feature of human psychology (Barrett, 2015; Barrett et al., 2013; Henrich, 2016). This does not mean, however, that people everywhere employ theory of mind in the same contexts or with the same frequency; rather, social norms and other cultural technologies may shape, sharpen, and direct its use. Institutions, or packages of culturally-transmitted social norms, exert a potent influence on psychology (Henrich, 2008, 2015; McNamara & Henrich, 2017). Institutions and psychologies culturally coevolve—social norms respond to economic and socioecological circumstances, while minds adapt ontogenetically to the opportunities and incentives created by institutions. Kin-based institutions, which govern practices related to marriage, residence patterns, and mutual familial obligations, are central among these evolving institutions. A growing literature links variations in kin-based institutions to cross-cultural

differences in several aspects of psychology (Enke, 2019; Henrich, forthcoming; Schulz et al., 2019). We hypothesize that attention to mental states in moral judgment is one important domain in the psychological package shaped by kin-based institutions.

2.1 The coevolution of kin-based institutions and cultural psychology

Within an evolutionary framework, institutions are packages of social norms that govern many aspects of human life, including patterns of exchange, religious participation, and political systems (Henrich, 2015, 2016). Social norms arise spontaneously via cultural evolution once individuals (1) rely sufficiently heavily on learning from others and (2) are capable of acquiring both 'what to do' in certain contexts (e.g., share food) and the standards for judging others in those contexts. Institutions rooted in kinship have historically been fundamental in organizing social life across human societies (Chapais, 2010; Fox, 1967; Murdock, 1949). Anchored in various aspects of our evolved psychology, including kin altruism, incest aversion, and pair-bonding, kin-based institutions organize people's social networks, in part by expanding on and either amplifying or suppressing the impacts of genealogical relatedness (McNamara & Henrich, 2017). These institutions structure patterns of marriage, residence, and mutual obligation, directing, for example, who should marry whom (is a first cousin a preferred or tabooed marriage partner?), where newly-wed couples live (with the bride's or groom's relatives?), and who one's natural allies are (if a man's father's brother's son is killed, is he honor-bound to avenge the death?). However, societies vary in how central kinship is to the formation of personal identity and social relationships; we term this *kinship intensity*.

Anthropologists distinguish between "intensive" and "extensive" kinship systems, tying variation in these institutions to ecological and economic factors. Societies with extensive kinship tend to encourage the formation of broad social networks with unrelated individuals, and often feature exogamy and bilateral descent (Schulz et al., 2019; Walker & Bailey, 2014). Work among mobile hunter-gatherers suggests that extensive kin-based institutions may have culturally evolved to mitigate ecological risk by creating broad, geographically dispersed social networks that can act as social safety nets after local shocks (Wiessner, 1998, 2002). In contrast, in societies with intensive kinship, kin-based institutions tightly control and constrain personal relationships. These societies are often characterized by extended family networks, cousin marriage, polygyny, endogamy, unilineal descent, and an increase in relatedness within kin groups (Schulz et al., 2019; Walker & Bailey, 2014). Scholars have argued that kinship systems often intensified with the scaling up of domesticated food production or with the intensive use of fixed foraging resources, such as coastal fisheries. In this novel context, where control and defense of land parcels and stationary resources became crucial to survival, the ability to mobilize large local communities via intensive kin-based institutions culturally evolved (Bowles & Choi, 2013; Dow, Mitchell, & Reed, 2017; Flannery & Marcus, 2012; Johnson & Earle, 2000). Because there is necessarily a trade-off between the breadth of ties and the density or depth of ties, in the terms used above, societies with intensive kin-based institutions have *high kinship intensity*, while those with extensive kin-based institutions have relatively *lower kinship intensity*[1].

[1] To clarify, kinship intensity can be conceptualized in relation to the density and redundancy of social network connections. Imagine a society modeled as a network of personal relationships. Some kin-based institutions create networks in which each relationship is embedded within a dense web of shared ties. That is, each pair of interactants shares many mutual partners– there are many redundant pathways reinforcing each relationship. This is high kinship

WEIRD societies evolved extremely low levels of kinship intensity via a different route than mobile hunter-gatherer societies: namely, the dissolution of both extensive and intensive kin-based institutions and the broad weakening of kinship as a central organizing force. Rather than the tightly webbed kin ties of societies with intensive kinship or the broadly dispersed family networks of societies with extensive kinship, WEIRD societies feature weak, isolated nuclear families, a pattern that emerged in medieval Europe (Goody, 1983; Greif, 2006; Todd, 1990). While the precise cause of the weak forms of kinship in Europe remains a matter of debate, a long tradition of anthropologists (Goody, 1983), economists (Greif, 2006), historians (Mitterauer, 2010), and cultural evolutionists (Henrich, forthcoming; Schulz et al., 2019) have argued that the medieval Church systematically dismantled the complex kin-based institutions in Western Europe. Whatever the ultimate cause, most scholars agree that independent, neolocal, monogamous, nuclear families had stabilized in many regions of Western Europe by around 1500 CE.

Today, trends towards weakening kinship have emerged in some other parts of the industrialized world, such as China and Japan, spurred in part by mid-20th century social and legal reforms (Baker, 1979; Ebrey & Watson, 1986; Hamilton & Sanders, 1992; A. Hashimoto & Traphagan, 2009). However, these shifts away from intensive kin-based institutions is relatively recent in these countries, and some scholars suggest that the process of change in social organization is ongoing (Campbell & Lee, 2011; Hamilton & Sanders, 1992; A. Hashimoto & Traphagan, 2009) Together, this suggests that WEIRD societies today lie at the extreme end of the global kinship intensity spectrum.

There is reason to suspect that different kin-based institutions—the first and often the most pervasive institutions that humans encounter during development—shape people's psychology. Different institutions create varying incentives, normative concerns, and social network configurations that push and pull on people's preferences, heuristics, emotions, attentional biases, and other aspects of cognition (Heine, 2016; Hoemann et al., 2019). Providing indirect support for a role for kin-based institutions in molding psychology, a large literature has connected different motivations, emotions, and perceptions to differences in interdependence and network density (Fowler & Christakis, 2010; Gelfand et al., 2011; Kitayama et al., 2017; Kitayama, Ishii, Imada, Takemura, & Ramaswamy, 2006; Kitayama & Park, 2010; Rand, Arbesman, & Christakis, 2011). Psychological variation has been linked to both relational mobility (the porousness or fluidity of one's social network: H. Hashimoto & Yamagishi, 2013; Li, Hamamura, & Adams, 2016; Sato, Yuki, & Norasakkunkit, 2014; Schug, Yuki, & Maddux, 2010; Thomson et al., 2018a) and residential mobility (geographical relocation: Lun, Oishi, & Tenney, 2012; Oishi & Talhelm, 2012). Although researchers do not often reference kinship in their discussions of either relational or residential mobility (c.f. Henrich, forthcoming), the connections seem hard to ignore.

Dovetailing with the work on social networks, two recent papers have directly connected kin-based institutions to aspects of psychology. Schulz et al. (2019) found that individuals from societies with high kinship intensity were less individualistic and more obedient; placed greater value on tradition and stable social relationships; and employed more holistic reasoning (Schulz

intensity. In contrast, other kin-based institutions create networks in which the average number of shared ties or redundant pathways between pairs is lower, and many pairs lack any at all. This is low kinship intensity.

et al., 2019). In addition, people from populations with high kinship intensity exhibit greater ingroup-oriented prosociality, favoring family members for jobs and expressing a willingness to lie for a friend in court; but less outgroup-oriented prosociality, making fewer anonymous blood donations and cheating more frequently in a behavioral economics game (Schulz et al., 2019). Similarly, Enke (2019) linked intensive kinship to (1) stronger ingroup loyalty and ingroup trust, (2) bigger difference in beliefs about the acceptability of violence against outgroup versus ingroup members, (3) more experience of shame versus guilt, and (4) a greater focus on purity during moral judgment. Here, we suggest that attention to mental states during moral judgment is part of the suite of psychological traits modulated by kinship institutions.

2.2 Why would kinship intensity influence the use of mental states in moral judgment?

We propose three non-mutually exclusive cultural evolutionary hypotheses to justify the prediction that the use of mental states in moral judgment should covary with kinship intensity. First, the benefit-to-cost ratio of considering mental states in the context of partner choice may be lower in societies with intensive kinship. Second, in societies with rigid, kin-based social networks and allegiances, outcome-focused moral judgment norms may culturally evolve as a way to sustain internal harmony. Both of these hypotheses would result in a reduced general tendency to engage in mentalizing during moral judgment in societies with intensive kinship. Finally, intensive kin-based institutions may magnify the impact of social distance on mentalizing in moral judgment, leading to greater differences in reliance on mental states when judging outgroup members compared to ingroup members. In the extreme, the mental states of socially distant strangers may not play a role in moral judgment. We will now further elaborate on each of these hypotheses.

2.2.1 Kinship intensity and the costs and benefits of mentalizing for partner choice

In the context of partner choice, kinship intensity may modulate the benefit-to-cost ratio of mentalizing during moral judgment. To understand this, consider an evolutionary model of partner choice in which individuals can access two kinds of information: (1) internal information, which includes the inferred mental states and dispositions of potential partners, and (2) external information, which includes input about local norms, social network ties, situational constraints, and potential partners' obligations and responsibilities. Let us further assume that external information is essentially cost-free in the context of evaluating any particular partner, because it is information that everyone needs to acquire simply to navigate the local social environment. By contrast, inferring and tracking others' mental states comes with a facultative cost, a developmental cost, or both. A facultative cost implies that every time an action needs to be evaluated by considering mental states, individuals must divert some additional cognitive resources (e.g., attention) to the evaluation; a developmental cost implies that individuals could, with some costly effort while growing up, hone a cognitive ability that automatically tracks and integrates inferences about mental states into their evaluation of others' actions at little or no effort per assessment (Buon, Jacob, Loissel, & Dupoux, 2013; Martin, Buon, & Cushman, 2019). Under this model, individuals would only pay the extra cost of tracking mental states if, on average, such inferences paid off in sufficiently better partner choice. If the external input to partner evaluation is by itself sufficiently accurate relative to the boost provided by mental-state inferences, individuals may adaptively conserve their cognitive resources by not deploying theory of mind in the evaluation of certain kinds of actions or for particular categories of people.

Instead, they may reallocate these resources to more productive ends (e.g., to acquiring even better external input).

Given this model, kinship intensity will influence the costs and benefits associated with mentalizing in moral judgment and partner choice, which may then help explain the variation observed across societies. In societies with intensive kin-based institutions, many closely monitored social norms regulate social life—these societies are characterized by greater "tightness", indicating the presence of strong norms and low tolerance for deviant behavior (Gelfand et al., 2011; Schulz et al., 2019). These norms often prescribe tightly-specified actions, depending on the context and the relationships of the people involved. Moreover, individuals are enmeshed in dense and enduring social networks on which they depend for economic production, social insurance, and personal safety.[2] In this social world, knowing the social norms, network ties, and personal relationships should be highly predictive of what individuals will do. Trust, for example, is best assessed by knowing the number of shared social ties and interdependencies between you and your potential partner. Even if your partner's internal inclinations tend towards larceny, having a dense and shared social network will likely transform him into a reliable and trustworthy actor. In this intensive kinship context, the available external information (shared norms, a potential partner's network ties, etc.) may be sufficient for predicting a potential partner's behavior; the added benefits of mental state inference in this context may be minimal and may not outweigh the cognitive costs. This may lead individuals to engage in relatively less mentalizing.

At the other end of the spectrum, in societies with low kinship intensity, social norms are few, poorly monitored, and often in flux. Network connections are widely dispersed, rarely inherited, and often ephemeral. People in such societies tend to be individualistic, independent, self-oriented, and concerned about creativity (Enke, 2019; Schulz et al., 2019). In this social world, knowing the norms and other external information is substantially less informative for predicting people's behavior. Thus, mental-state tracking and inferences usually pay off, providing substantial improvements in partner choice that cover the cognitive costs of integrating mental-state information (Chakroff et al., 2016; Young & Tsoi, 2013; Young & Waytz, 2013). Hence, in societies with weak kinship, mentalizing should be more prevalent in moral judgments and more effective in assessing novel partners for cooperative interactions (Carter & Weber, 2010; Oishi, Schug, Yuki, & Axt, 2015; Yamagishi, Kikuchi, & Kosugi, 1999).

2.2.2 Kinship intensity, mentalizing norms, and community harmony

Outcome-focused norms of moral judgment may culturally evolve in societies characterized by intensive kinship. In particular, these societies may be able to quell internal conflicts and sustain greater harmony by suppressing the use of mental states in moral judgments (Posner, 1980). Consider a community with five different clans in a region in which both economic productivity and physical security increase when the clans all work in harmony. If someone from Clan A kills someone from Clan B, the clans may be able to agree on the facts (what happened?) but not on

[2] N.B. Although these static networks constrain partner choice to a certain extent, individuals nonetheless have some latitude to select their cooperative partners (Nolin, 2010). Of course, some small-scale societies where partner choice has been studied possess relatively extensive kinship systems, so a larger role for partner choice in these places is precisely what we'd expect (Bliege Bird & Power, 2015; Von Rueden, Redhead, O'Gorman, Kaplan, & Gurven, 2019).

the perpetrator's mental states. Did the person from Clan A *intend* to murder the person from Clan B and steal his wife? Clan A is positive it was an accident, while Clan B is sure it was purposeful. When settling on the appropriate punishment (e.g., blood payment) for an action, disagreements over inferred intentions or other mental states are a potentially serious source of social conflict. In such a world, there are no impartial third parties, you are either an ally of Clan A or Clan B, and this alliance determines your opinion. How can such a conflict be adjudicated? There are several ways, but one is to suppress reliance on mental states and attend only to observable outcomes.

Of course, purely outcome-based moral judgments (often called "strict liability") can also cause conflict, for example in the case of accidental harm or transgressions in the service of a greater good. However, when strict liability is a social norm—everyone anticipates that others will use outcome-based judgments—dangerous conflicts may be avoided. Anyone who tries to introduce mental states into discussions about culpability breaks a local norm. Consistent with this, ethnographers studying societies with strict liability argue that such outcome-based judgments—devoid of complicated and biased inferences about intentions—help alleviate resentments and heal social wounds caused by harmful acts (Moore, 1972).

By contrast, in societies lacking intensive kinship, individuals are keenly interested in the mental states of others as they search for partners and develop new relationships. Swapping information about others' mental states is a regular part of social discourse. In such social worlds, communal harmony is not greatly endangered by mental-state inferences because these societies are built on fluid network structures. This means that (1) individuals are not ensconced within loyal kin groups ready to defend their honor against all outsiders and (2) relatively impartial adjudicators can often be found to help resolve disagreements about the mental states of the actors involved. Outcome-focused norms of moral judgment may be less likely to culturally evolve in these contexts.

2.2.3 Kinship intensity, mentalizing, and intergroup psychology

Intensive kinship may also influence the use of mentalizing in moral judgments by tightening the ingroup, sharpening the distinction between ingroups and outgroups, and solidifying ingroup loyalty. Group membership and intergroup dynamics modulate cognition: in many realms, including morality, how we think about "us" is not the same as how we think about "them" (Cikara & Van Bavel, 2014; Waytz & Young, 2018). Outgroup members can have very different norms and opaque intentions, making it too difficult or costly to try to predict their behavior based on mental states. As a result, people everywhere may be relatively less prone to consider intentions when interacting with socially-distant outgroup members compared to close ingroup members. In support of this idea, there is some evidence that WEIRD people engage in less spontaneous mentalizing when making judgments about outgroup members (Harris & Fiske, 2006, 2009, 2014), although this pattern can reverse when the context is competitive or threatening (Cikara & Van Bavel, 2014; Tsoi & Young, 2018). In addition, WEIRD children use fewer mental-state terms when describing outgroup members compared to ingroup members (Mcloughlin & Over, 2017).

Considering these psychological patterns, intensive kinship may magnify the impact of a target's social distance or outgroup membership on the use of mentalizing in moral judgments.

Individuals from societies with more intensive kinship show a greater distinction in how they think about ingroup versus outgroup members across several domains. They show a sharper difference in their trust of family, friends, and people they know versus people from other countries, religions, and strangers; a greater emphasis on loyalty to their community; and a bigger difference in beliefs about the acceptability of violence against outgroup versus ingroup members (Enke, 2019; Schulz et al., 2019). Moreover, the radius of the ingroup may be smaller in societies with intensive kinship relative to those with weak kinship. While clans, kindreds, or tribes may serve as the relevant "ingroup" in populations with intensive kinship, communities with extensive or sparse kin ties may have more expansive ingroups, such as those based on national or religious identity (Brewer & Pierce, 2005). In line with this, people from societies with loose kinship place more emphasis on universal moral values compared to those from societies with intensive kinship– that is, people from loose kinship societies expect others within a much larger social radius to follow the same rules of conduct that they do (Enke, 2019). Thus, given (1) the tendency of people from societies with intensive kinship to avoid interaction with socially distant individuals and (2) the complexity of inferring the mental states of more socially distant individuals, the use of mental states in moral judgments may decline more rapidly with social distance in societies with intensive kinship.

Unfortunately, the available data only allow us to test for a relationship between kinship intensity and the use of mental states in moral judgments. We cannot study the interaction between social distance and kinship intensity or to address some of the other features of the theory just presented. It is worth emphasizing, though, that these three hypotheses—regarding partner choice, community norms, and intergroup psychology—are not mutually exclusive. Figure 1 depicts the potential relationships between kinship intensity, mentalizing during moral judgment,

Figure 1. Visual representation of hypothesized relationships between kinship intensity, mentalizing during moral judgment, and social distance. In societies with low kinship intensity (blue line), people rely heavily on mental states in moral judgment, but this tendency declines as social distance between the judger and the actor increases. Line A represents a scenario in which increasing kinship intensity leads people to generally engage in less mentalizing during moral judgement, and this effect is not dependent on social distance. For example, the benefit-to-cost ratio of mentalizing in the context of partner choice may be lower than in low kinship intensity societies, and/or there may be group-level social norms demanding outcome-based judgments instead of mentalizing. Line B represents a scenario in which increasing kinship intensity magnifies the impact of social distance on mentalizing in moral judgment but does not cause an overall decline in this tendency with respect to close kin. Line C synthesizes the first two possibilities– increasing kinship intensity *both* causes a general decline in mental-state reasoning during moral judgment *and* magnifies the impact of social distance.

and social distance. Although we cannot investigate these dynamics in detail, we have provided a fuller account of the theory in order to motivate future empirical work and formal modeling of this evolutionary reasoning.

3. Mental states in moral judgment in the ethnographic record

In the global and historical spectrum, just how prevalent is the tendency to deemphasize mental states during moral judgment? Recent studies have begun to document cross-cultural variation in this tendency (Barrett et al., 2016; McNamara, 2016; McNamara et al., 2019). However, despite careful design and implementation, some researchers may worry that these results reflect participants' misunderstanding or some other experimental issue. To assuage these fears, we show that norms and institutions that suppress mental-state reasoning appear in ethnographies worldwide. In particular, even when they were not looking for these practices, ethnographers have frequently documented the presence of (1) an *opacity of mind* (the belief that others' minds are fundamentally unknowable), (2) *strict liability* (culpability depends only or largely on outcomes), and (3) *collective guilt* (culpability is shared equally by group members so individual mental states receive little or no weight). Rather than supporting the idea that WEIRD subjects' powerful focus on intentions represents universal *Homo sapiens* psychology, these anthropological accounts instead suggest that attention to mental states in moral judgment has often been suppressed in societies around the world, and may actually have hypertrophied in Western populations over the last millennium (Berman, 1983; Henrich, forthcoming).

3.1 Opacity of mind

Norms and beliefs about the mind and about the appropriateness of discussing others' mental states may influence the extent to which people deploy mentalizing in certain contexts. Anthropologists working in the Pacific and elsewhere have documented what they term "Opacity of Mind," a cluster of norms and beliefs that, potentially in diverse ways, present others' minds as essentially unknowable or opaque (reviewed in Robbins & Rumsey, 2008). In many societies where Opacity of Mind norms operate, it is considered socially unacceptable to publicly speculate about the internal mental states of others, and anyone who gossips about others' intentions may be sanctioned (Robbins & Rumsey, 2008). Even introspection, thinking about one's *own* mind, is reportedly considered to be suspicious in some groups (Duranti, 2015). This is not to say that people who adhere to Opacity of Mind never engage in belief attribution or are unable to use theory of mind; as mentioned above, current evidence suggests that mentalizing abilities are reliably developing features of human cognition (also, see Supplement 3). Indeed, in his detailed treatment of Opacity of Mind among Samoans, even Duranti (2015) highlights several situations in which intentions come into play.

Nevertheless, anthropologists have documented various ways that Opacity of Mind seems to influence behavior, and perhaps cognition. For example, in her work among the Bosavi of Papua New Guinea, Schieffelen reports that caregivers do not make verbal inferences about infants' mental states or expand on (or infer the deeper meaning of) young children's unclear utterances. When children mention their own or others' mental states, adults correct them by stating what is externally evident (e.g., crying rather than sadness: Luhrmann et al., 2011; Schieffelin, 1990, 2008). This suggests that children spontaneously start to infer mental states, even when this behavior is rarely modeled for them, providing further evidence that theory of mind is an evolved

psychological capacity. However, it also shows Opacity of Mind norms in action: children are socialized from a young age to deemphasize internal states and focus on real-world outcomes. In a similar vein, Robbins and Rumsey (2008) describe how people living in Opacity of Mind societies make little reference to empathy when discussing their approach to life. A common theme in these societies is the idea that internal or inferred intentions have little causal influence on the world compared to spoken or demonstrated intentions—that is, actions (Robbins & Rumsey, 2008). This view contrasts starkly with the WEIRD conception of the mind as knowable and a causal force behind actions (Luhrmann et al., 2011)— a view common in cognitive science.

Some recent empirical evidence from Fiji supports the idea that Opacity of Mind can modulate the tendency to engage in mentalizing. First, McNamara and colleagues (2018) found that indigenous Fijians have a reduced tendency to predict an agent's behavior based on inferences about their false beliefs in an adult version of the false-belief task, compared to both Indo-Fijians and North Americans (neither of whom adhere to Opacity of Mind norms). In this same study, self-report measures indicate that indigenous Fijians think about others' internal mental states less than do either Indo-Fijians or North Americans, and that this tendency may explain their performance on the false-belief task. These results suggest that Opacity of Mind norms may reduce indigenous Fijians' propensity to engage in mental-state reasoning. Relatedly, recall that Fijians place little focus on intentions when making moral judgments, judging low- and high-intent harms equally harshly (Barrett et al., 2016; McNamara et al., 2019). This effect may not merely be behavioral. Crucially, priming Fijians to think about thoughts shifts their judgments to place more weight on intentions. This suggests that, under normal circumstances, intentions may not be highly salient for Fijians. If they were privately considering intentions but purposefully excluding this information from their explicit judgments, priming thinking about thoughts would probably not influence their performance on this task (McNamara et al., 2019). Together, this line of research suggests that Opacity of Mind modulates cognition, reducing adherents' propensity to engage in mental-state reasoning.

3.2 Strict liability

Cross-culturally, rules about establishing legal or normative liability for crimes represent a second category of norms that may both reflect and influence people's tendency to focus on mental states versus outcomes in the context of moral judgment. These norms relate directly to explicit moral judgments, since they dictate the conditions that must be met in order to hold a person responsible for an action. Norms of liability that place a heavy emphasis on intention should, accordingly, make intentions particularly salient. In contrast, norms of liability that focus on outcomes should make intentions and other mental states less salient during moral judgment.

In the Western legal tradition, mental states play a crucial role in establishing liability and determining appropriate punishments. Consider, for example, the distinction in the U.S. criminal code between homicide (which involves *malice*, the legal term for intention) and manslaughter (which does not involve malice). Both acts produce the same outcome (a death), but while homicide may be punished by life in prison or capital punishment, the sentence for manslaughter tops out at 15 years of incarceration (Legal Information Institute, n.d.). While punishment for some transgressions (e.g., statutory rape) more heavily weight outcomes, establishing intent is a key feature of many Western court cases. A commonly cited maxim in English criminal law

states "*actus non facit reum misi mens sit rea*: an act does not make a man guilty unless his mind is guilty too" (Goldman, 1993, p. 63). These norms extend beyond formal legal proceedings: as noted at the beginning of this paper, many Westerners intuitively feel that intentions play a crucial role in personal responsibility and moral status, a pattern evident in numerous neuropsychological studies (Cushman, 2015; Young & Tsoi, 2013).

In striking contrast to Western conceptions of liability, the ethnographic record indicates that many societies subscribe to some form of "strict" liability. Here, motives, intentions, and other mental states play a diminished role in determining culpability; instead, outcomes are the central– and sometimes only– focus (Moore, 1972; Posner, 1980). In societies where strict liability is common, similarly harsh punishments are levied on both intentional and accidental transgressors. While it is important to note that people in societies with strict-liability norms do sometimes take intentions and motives into account (a fact occasionally neglected in the literature; see Ch. 1 of Goldman, 1993 for discussion), it seems plausible that the presence of these norms could down-regulate people's tendency to think about intentions when making moral judgments.

Thus, norms related to strict liability appear plausibly linked to the use of mental-state reasoning during moral judgments. However, unlike the Opacity of Mind literature, no extensive cross-cultural review exists on strict liability. To begin to fill this gap, we surveyed the ethnographic literature to determine the prevalence of strict liability across diverse societies and geographic regions. In addition, as a first test of our central hypothesis, we used ethnographic data on kinship to examine the relationship between kinship intensity and the presence of strict liability.

We also investigated a second norm of legal liability that may deemphasize mental states: collective guilt. Here, culpability is shared equally by the perpetrator's group members, whose mental states receive little weight. However, while collective guilt may reflect reduced mental-state reasoning, it represents a less clear-cut case than strict liability. Therefore, results for this portion of the ethnographic review, which tell the same story as strict liability, are left to Supplement (S3).

3.2.1 Methods

We reviewed ethnographies from the Standard Cross-Cultural Sample (SCCS) cases present in the electronic Human Relations Area Files (eHRAF, ehrafworldcultures.yale.edu, $n = 146$). Based on a total of 4,706 paragraphs of ethnography, we coded each society for the presence or absence of strict liability. Our coding scheme included the following categories: -1 (not enough data), 0 (evidence of absence), 0.5 (intermediate), or 1 (present). Most coded cases focused on punishment for harms that resulted in death. Each society was coded by two independent raters, and all disagreements were adjudicated to create the final data set (for detailed methods, see Supplement S1). Of the full sample of 146 societies, the final data set contains data (a strict liability rating of 0, 0.5, or 1) for 38 societies. Using data from the SCCS, we examined the distribution of societies with strict liability across subsistence styles and regions of the world.

We then tested the relationship between kinship intensity and the presence of strict liability. We followed the methods laid out by Schulz et al. (2019) to create a Kinship Intensity Index, combining SCCS variables related to kin-based institutions: cousin marriage preference,

polygamy, co-residence of extended families, lineage organization, and community organization (see S4.1 & S6.1 for details). To analyze the data, we first employed multinomial logistic regression (R package nnet, version 7.3-12). In order to take the missing data into account, all four levels of the dependent variable (-1 = no data; 0 = absent; 0.5 = intermediate; 1 = present) were included in the models. To get more power in this analysis with small sample sizes, we then pooled societies coded as "intermediate" (0.05) with "absent" (0), excluded societies with no data, and re-ran the analyses using binomial logistic regression. We controlled for two measures of coder uncertainty in the models (whether the coders disagreed in the first round of coding and whether the coders were uncertain about their final, adjudicated decision). However, due to sample size constraints, we were unable to include other potentially relevant controls, such as subsistence style or levels of jurisdictional hierarchy. See Supplement S4.1 for more details on our approach to this analysis. Analyses were run in R (version 3.5.2).

3.2.2 Results

In this ethnographic sample, societies with strict liability are common and widespread across subsistence modes and regions of the world (Table 1, Figure 2). Of 38 societies with enough data to code strict liability, 42% (n = 16) clearly have the norms and 26% (n = 10) provide intermediate or less clear evidence. As Figure 2 and Table 1 illustrate, societies with strict liability occur across disparate regions of the world, from sub-Saharan Africa, to East Asia, to South America, and include hunter-gatherers, horticulturalists, pastoralists, and agriculturalists. Table 2 shows a sample of ethnographic excerpts from some of the societies with strict liability.

We consistently found a positive but imprecisely estimated relationship between kinship intensity and the presence of strict liability in this sample. Multinomial logistic regression suggests that for a 1 standard deviation increase in the Kinship Intensity Index, the relative risk of observing strict liability compared to not observing strict liability is 1.36, but the confidence intervals are wide and include 1 (OR = 1.36, [95%CIs 0.62, 2.98], p = 0.44). Similarly, using binomial logistic regression, a one standard deviation increase in the Kinship Intensity Index is associated with a 40% increase in the odds of having strict liability, but again, the confidence intervals contain 1 (OR = 1.40, [95%CIs 0.66, 3.2], p = 0.39). Including controls for coder uncertainty does not substantially alter these results. In addition, results of the multinomial logistic regression suggest that as kinship intensity increases, the likelihood of having missing data for strict liability declines. See Supplement S4.3 for more detailed results.

3.2.3 Discussion

Although the results suggest that the more intensive a society's kinship, the greater the likelihood of an ethnographer noting strict liability, the size of this relationship was not estimated with

Table 1. Societies with strict liability across subsistence style

	Strict Liability		
Subsistence Style	*Present*	*Intermediate*	*Absent*
Mobile Hunter-Gatherers	1	0	1
Complex Hunter-Gatherers	7	1	3
Horticulturalists	1	4	1
Pastoralists	4	1	0
Intensive Agriculturalists	3	2	5
Other Combinations	0	2	2
Total	16	10	12

Notes: Societies in the SCCS were rated for presence of strict liability based on ethnographic texts from eHRAF. Data on subsistence style comes from eHRAF. The category "Pastoralists" includes societies defined as "Pastoralist" or "Agro-pastoralist" by eHRAF, and the category "Other Combinations" includes the eHRAF classifications "Other Subsistence Combinations" and "Commercial Economy". Societies classified in eHRAF as "Hunter-Gatherers" or "Primarily Hunter-Gatherers" were divided into "Mobile" and "Complex" hunter-gatherers based on 5 SCCS variables: food storage, mobility, local hierarchy, community size, and presence of lineages. See Supplement S5 for more details.

Figure 2. Strict liability is widespread in the eHRAF Standard Cross-Cultural Sample. In the 38 societies with evidence of absence or presence of strict liability, strict liability is present in 42% (n = 16), intermediate in 26% (n = 10), and absent in 32% (n = 12). Societies with strict liability appear in regions around the world. 108 societies did not have enough relevant data to judge presence or absence of strict liability.

precision and fell well below conventional cutoffs. This persistent uncertainty is unsurprising for several reasons. First, the sample sizes are quite small, preventing the inclusion of potentially important covariates such as subsistence style and jurisdictional hierarchy beyond the local community (often used as a measure of state development). Second, ethnographic data are messy, and there is substantial room for bias in the written ethnographic literature, the availability of relevant ethnography, and the coding process. Third, data were missing from 108 societies, and the "missingness" does not appear to scatter randomly with respect to kinship intensity, which likely introduces bias into the analysis. Given these constraints, we believe that the results of the ethnographic review are best suited to simply providing a suggestion of how these practices may have been historically and globally distributed. In addition, most (75%) of the cases of strict liability uncovered in the review concerned harms that resulted in a death– a particularly severe and final type of transgression. It is possible that moral judgments for less serious harms may be less outcome-focused in some societies; our ethnographic review cannot speak to all moral judgments. We note, however, that Barrett et al.'s (2016) study uncovered tendencies towards strict liability in several societies in response to vignettes featuring harms like theft and battery. This indicates that strict liability can operate for transgressions that do not result in death. Overall, the presence of strict liability in societies from across the globe and the spectrum of subsistence styles suggests that the tendency to deemphasize mental states for at least some types of moral judgments has been widespread.

In light of recent cross-cultural studies on the use of mental states, our review of the ethnographic evidence on Opacity of Mind and strict liability indicates that there may be, and certainly may have been, substantially more variation in the centrality of mental states for moral judgment than existing work in WEIRD populations suggests. While far from conclusive given the amount of missing data, this review suggests that substantial variation may exist, and WEIRD societies likely represent one extreme.

We now turn to testing the hypothesis that this variation can be explained by kinship intensity.

4. Kinship intensity and reliance on mental states in moral judgments

We expanded an existing dataset from Barrett et al. (2016), who investigated moral judgments using vignettes in a diverse sample of ten societies that varied across subsistence mode, geography, ecology, and language (Figure 3, Table S4). In this study, 322 participants rated the badness, punishment-worthiness, and reputation-damaging effects of different harm scenarios in two studies. In the first, the *Intention vignettes* featured either high-intent harm (e.g. an agent stealing someone's bag) or low-intent harm (e.g. an agent mistaking someone's bag for their own and taking it). These vignettes varied across domain: physical harm (striking someone in the face), theft (taking someone else's bag), poisoning (contaminating the community water source with insecticide), and food taboo violation (eating a locally tabooed food item). In the second study, a set of *Mitigating Factor vignettes* featured either intentional battery or battery that involved a potentially mitigating factor that might soften the severity of moral judgment (e.g. self-defense or necessity). We combined these data on moral judgments with blind-coded ethnographic data on kinship intensity from each field site. We then examined the relationship between kinship intensity and severity of judgment for (1) low- versus high-intent harms and (2) harms that involved a potentially mitigating factor versus those that did not.

Figure 3. Cross-cultural sample from Barrett et al. (2016). The research team conducted moral judgment vignettes in a diverse sample of 10 societies.

Following from the framework laid out in this paper, we hypothesized that the tendency to consider intentions in moral judgments would decline with kinship intensity. That is, we expected the difference in severity of moral judgment for high- versus low-intent harms to shrink as kinship intensity increased. We made no specific predictions about the different vignette domains (theft, poisoning, etc.). However, it is worth noting that we can only expect to see the hypothesized pattern for a given domain if people consider violations in that domain to be important. For example, if a vignette features an action that participants do not see as a meaningful violation, we would expect them to make lenient judgments regardless of the actor's intent.

Furthermore, we reasoned that taking potentially mitigating factors into consideration involves mental state attribution; the participant must think about what the perpetrator intended or believed about the situation (e.g., that they were acting in self-defense, or believed they had no other option). We therefore hypothesized that the effect of mitigating factors on the severity of moral judgment would decline with kinship intensity.

We pre-registered the hypothesis that there would be a negative relationship between kinship intensity and the use of mental states in moral judgment. Note, however, that because this project began as a paper for the first author's graduate coursework, pre-registration occurred after some preliminary data analysis had already been conducted. After pre-registration, the data were re-analyzed using newly blind-coded ethnographic data on kinship intensity.

4.1 Methods

4.1.1 Severity of Moral Judgment Index

Because the three moral judgment measures (badness, punishment-worthiness, and reputational damage) were highly internally consistent (Cronbach's $\alpha = 0.81$ [95% CIs 0.79, 0.82]), following Barrett et. al., we combined them to create an overall Severity of Moral Judgment Index. A Principal Component Analysis revealed that the first principle component (PC1) explained 72% of the variance in these three variables. The loadings on PC1 were used as weights to generate the Severity of Moral Judgment Index, a weighted sum of judgments about badness, punishment-worthiness, and reputational damage. A high value indicates harsh moral judgment and a low value indicates a lenient judgment (for details, see S6.3).

Table 3. The Kinship Intensity Survey coding scheme

		Kinship Intensity	
Survey Variable	*Description*	*Low Intensity*	*High Intensity*
Domestic organization	Prevailing form of domestic or familial organization	Independent nuclear families	Extended family households
Post-marital residence	Prevailing pattern of transfer of residence at marriage	Neolocal	Non-neolocal (e.g. patri-, matrilocal)
Descent pattern	Prevailing mode of familial affiliation	Bilateral	Unilineal (patrilineal, matrilineal)
Cousin marriage	Frequency and acceptability of marriage between cousins	Absent, forbidden	Common, preferred
Polygamy	Frequency and acceptability of marriage between a man and >1 wife	Absent, forbidden	Common, preferred
Corporate land ownership	Frequency of collective land tenure (e.g. by clans)	Absent	Common
Clans	Presence of clans, phratries, or other large kin groups	Absent	Present
Segmented communities	Residence localized by kinship (e.g. clan barrios)	Absent	Present
Segmentary lineages	Kinship defined by relative position in hierarchical, branching segments	Absent	Present

Notes: An ethnographer from each of the ten field sites filled out the Kinship Intensity Survey, commenting on both contemporary and traditional practices when possible. Ethnographers were blind to the purpose of the study and to the specific hypotheses. Responses were rated for kinship intensity by three blind coders, according to this scheme. Variables were scored continuously where possible, especially when quantitative data was provided (for example, actual rates of cousin marriage). See S6.1 for more details on the coding of the Kinship Intensity Survey.

4.1.2 Kinship Intensity Index

To create a measure of kinship intensity for each society, we first designed an ethnographic survey about kinship. Following the work of Schulz et al. (2019), the survey questions were corporate ownership of land, and presence of clans, segmentary lineages, segmented communities, and age sets. Each of these practices relates to kinship intensity. For example, matrilocal, patrilocal, or bilocal post-marital residence encourage intensive kinship by maintaining proximity and close ties between one spouse and his or her kin, whereas neolocal post-marital residence promotes more extensive kinship by placing couples in neighborhoods or communities away from blood relatives, where they are more likely to form extensive ties with unrelated neighbors (Schulz et al., 2019). For more details about each sub-indicator and how it relates to kinship intensity, see S6.1. We then asked an ethnographer from each of Barrett et al.'s (2016) ten field sites to fill out this survey. The ethnographers were blind to the purpose of the study and to the hypotheses.

Three blind coders rated each of these variables for kinship intensity, from 0 (low intensity) to 1 (high intensity) according to the scheme presented in Table 3. There was no variation in the presence of age sets in this sample, so we excluded this variable from all analyses. To create a society-level Kinship Intensity Index (KII), we averaged across the remaining 9 contemporary kinship measures (a separate Ancestral Kinship Intensity Index was also created to reflect traditional practices; see S6.2). We chose to summarize these variables because in different societies, intensive kinship may culturally evolve via different pathways and thus different combinations of these variables. Kinship Intensity Index scores generated from the three blind coders were highly consistent (Intraclass Correlation Coefficient = 0.95, [95% CIs 0.86, 0.99]).

4.1.3 Data Analysis

We employed Linear Mixed Effects Regressions (R package lme4, version 1.1-19) to analyze the results. For the Intention vignettes, we examined each scenario separately (theft, physical harm, poisoning, and food taboo). To do this, we ran a single model that interacted scenario, Kinship Intensity Index, and intention condition on Severity of Moral Judgment Index. For vignette observation *v*, individual *i*, in society *s*:

$$\begin{aligned} MJ_{vis} = \beta_0 + \beta_1 Scenario_{vis} + \beta_2 Intent_{vis} + \beta_3 KII_s + \beta_4 (Scenario_{vis} \times Intent_{vis}) \\ + \beta_5 (KII_s \times Scenario_{vis}) + \beta_6 (KII_s \times Intent_{vis}) \\ + \beta_7 (Scenario_{vis} \times Intent_{vis} \times KII_s) + \theta_{is} + \omega_{is} + \varphi_s + \varepsilon_{vis} \end{aligned}$$

where:

- *MJ* is the Severity of Moral Judgment Index
- *Scenario* is a categorical variable indicating the vignette scenario (theft, physical harm, poisoning, or food taboo violation)
- *Intent* is a dummy indicating whether the vignette featured a high- or low-intent harm
- *KII* is the Kinship Intensity Index
- θ is a vector of individual covariates (age and sex)
- ω is an individual random intercept
- φ is a society random intercept
- ε is the error term

We report the main output variables of interest below, omitting additional output variables for the sake of simplicity.

For the Mitigating Factors vignettes, we interacted the Kinship Intensity Index and mitigating condition on the Severity of Moral Judgment Index. Using the same notation as above:

$$MJ_{vis} = \beta_0 + \beta_1 Mitigating_{vis} + \beta_2 KII_s + \beta_3 (Mitigating_{vis} \times KII_s) + \theta_{is} + \omega_{is} + \varphi_s + \varepsilon_{vis}$$

All models include random intercepts for subjects and societies. All continuous variables were standardized.

Due to missing data on sex, one participant was removed from the analysis, leaving a total of 321 participants in the Intentions sample. Due to the structure of the Mitigating Factors vignette sets, only subjects who completed vignettes featuring self-defense and necessity also completed the control intentional vignette. This constrains our Mitigating Factors analysis to include only 147 subjects from 9 societies (no Mitigating Factors data were collected from Himba participants).

Data analyses and visualizations were produced in R (version 3.5.2). Data files and code are available on OSF.

4.2 Results

For three of the four vignette scenarios, Table 4 and Figure 4 reveal a significant negative interaction between kinship intensity and intentionality on the severity of moral judgments (given as standardized ß coefficient [95%CI], *p*-value): theft (ß = –0.53 [–0.68, –0.38], $p < 0.001$), physical harm (ß = –0.30 [–0.45, –0.15], $p < 0.001$), and poisoning (ß = –0.22 [–0.35, –0.094], $p < 0.001$). For food taboo violations, the coefficient on the interaction term is negative but much smaller than the other coefficients, and the confidence interval includes zero (ß = –0.11 [–0.26, 0.052], $p = 0.19$). When pooling across all four scenarios, the interaction between kinship intensity and intent on the severity of moral judgments remains negative and significant (ß = –0.30 [–0.39, –0.22], $p < 0.001$, Table S5, Column 2).

The coefficient on this interaction term represents the change in slope between the KII and the Severity of Moral Judgment Index when comparing high-intent vignettes to low-intent vignettes. For example, moving one standard deviation on the Kinship Intensity Index scale is associated with about one-third of a standard deviation increase in the Severity of Moral Judgment Index for low-intent vignettes involving physical harm (ß = 0.33 [–0.01, 0.68], $p = 0.055$, Table 4, Column 2). To visualize this, see the positively-sloped blue line in Figure 4, Panel 2. In contrast, for high-intent physical harm vignettes, there is essentially no change in the severity of moral judgment across kinship intensities (ß = 0.037 [CIs –0.31, 0.39], $p = 0.81$; see the flat red line in Figure 4, Panel 2).

As illustrated in Figure 4, the negative interaction between kinship intensity and intentionality means that there is a larger difference in severity of judgment for high- versus low- intent harms in societies with low kinship intensity compared to high kinship intensity. At one extreme, in societies with the lowest kinship intensity, Los Angeles and Storozhnitsa, participants substantially adjusted their judgments depending on whether a harm was low- or high-intent (1.35 and 1.80 standard deviation difference in the severity of judgment, respectively, across all

vignettes). At the other extreme, in the societies with the highest kinship intensity in the sample, Yasawa, Fiji and Sursurunga, participants judged high- and low-intent harms similarly harshly (0.078 and 0.85 standard deviation difference in the severity of judgment, respectively, across all vignettes).

The relationship between kinship intensity and the use of intentions during moral judgment holds up to several robustness checks, including controlling for measures of ecological risk (S6.4, S7.2), using ancestral kinship intensity as the main predictor (S7.3), and examining each moral judgment (badness, punishment, and reputation) separately (S7.4).

Table 4. Kinship Intensity, Intentionality, & Severity of Moral Judgment

	Severity of Judgment Index			
	Theft (1)	Physical Harm (2)	Poisoning (3)	Food Taboo (4)
Contemporary KII	0.37* (0.024, 0.72)	0.33 (-0.010, 0.68)	0.13 (-0.21, 0.47)	0.39* (0.040, 0.74)
High Intent	0.94*** (0.77, 1.1)	0.81*** (0.64, 0.97)	0.60*** (0.45, 0.74)	0.26** (0.077, 0.43)
KII x High Intent	**-0.53*** (-0.68, -0.38)**	**-0.30*** (-0.45, -0.15)**	**-0.22*** (-0.35, -0.094)**	**-0.11 (-0.26, 0.052)**
Age	0.028 (-0.023, 0.079)	0.028 (-0.023, 0.079)	0.028 (-0.023, 0.079)	0.028 (-0.023, 0.079)
Sex	-0.068 (-0.16, 0.029)	-0.068 (-0.16, 0.029)	-0.068 (-0.16, 0.029)	-0.068 (-0.16, 0.029)
Random Effects				
Subject Standard Dev.	0.26	0.26	0.26	0.26
Society Standard Dev.	0.42	0.42	0.42	0.42
N per vignette	321	320	321	317
AIC	2987.5	2987.5	2987.5	2987.5
Log Likelihood	-1457.7	-1457.7	-1457.7	-1457.7

Notes: LMER estimates with 95% confidence intervals. To produce the results shown here, we ran a single model that interacted vignette scenario, Kinship Intensity Index, and intention condition on Severity of Moral Judgment Index. The full sample included in the model contains 1279 observations; the *N* listed in each column of this table gives the number of observations per vignette. Additional output variables have been omitted for simplicity; the R code for the full results is available on OSF. *Contemporary Kinship Intensity Index* combines measures of current kinship practices: domestic organization, post-marital residence, cousin marriage, polygamy, descent pattern, corporate ownership of land, and presence of clans, segmentary lineages, and segmented communities. *High Intent* indicates whether the vignette features a high intent harm (compared to a low intent, i.e. accidental, harm). The Severity of Judgment Index combines measures of badness, punishment-worthiness, and reputation-damaging effects of harms. *Age* and *Sex* are individual-level covariates. All continuous variables have been standardized.

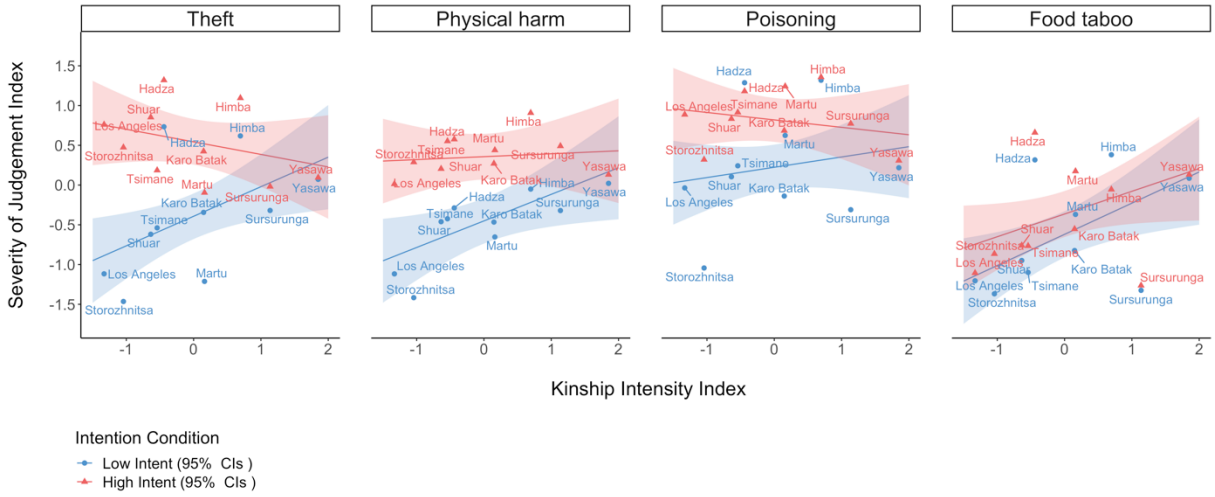

Figure 4. Reliance on intention in moral judgment decreases with kinship intensity across three vignette scenarios. The regression lines show fitted values and 95% confidence intervals produced by Linear Mixed Effects Regression models predicting Severity of Moral Judgment Index from the interaction between Kinship Intensity Index and intentionality condition in four vignette scenarios: theft, physical harm, poisoning, and food taboo violation. The Severity of Judgment Index combines measures of badness, punishment-worthiness, and reputation-damaging effects of harms. The models include random intercepts for subjects and societies and individual-level covariates (sex & age). All continuous variables have been standardized. Labeled points show the average Severity of Judgment Index in each society for high and low intent harms.

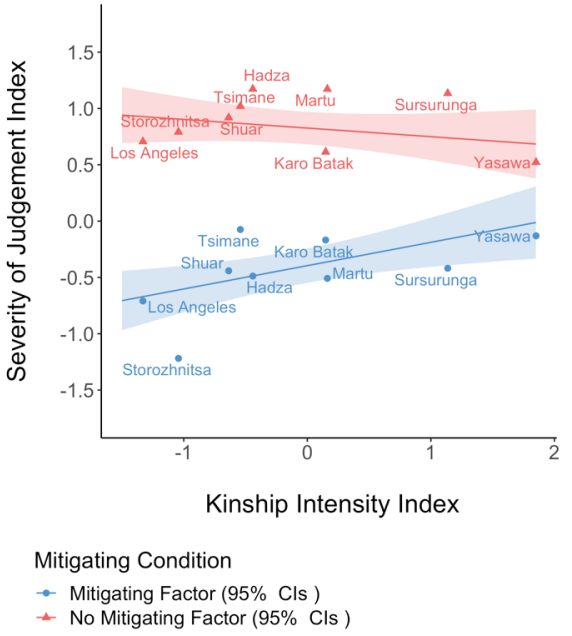

Figure 5. Effect of mitigating factors on severity of moral judgment declines with kinship intensity. The regression lines show fitted values and 95% confidence intervals produced by Linear Mixed Effects Regression predicting Severity of Moral Judgment from the interaction between Kinship Intensity Index and mitigating condition. The Severity of Judgment Index combines measures of badness, punishment-worthiness, and reputation-damaging effects of harms. The model includes random intercepts for subjects and societies and individual-level covariates (sex & age). All continuous variables have been standardized. Labeled points show the average effect of mitigating factors in each society.

Paralleling the above, our analysis of the data on mitigating factors further confirms this relationship. Figure 5 and Table S8 reveal a significant, negative interaction between KII and mitigating condition on the severity of moral judgment (ß = –0.28 [–0.39, –0.17], $p < 0.001$). Similar to above, this interaction represents the change in slope between the KII and the Severity of Moral Judgment Index when comparing vignettes without a mitigating factor to those with a mitigating factor.

4.3 Discussion of Experimental Analysis

The results of this analysis provide support for the hypothesis that reliance on mental states during moral judgment declines as kinship intensity increases. The analysis of low- versus high-intent vignettes suggest that people in societies with low kinship intensity tend to heavily weight intentions when making moral judgments, while those in societies with high kinship intensity place less weight on mental states. This result holds for vignettes involving theft, physical harm, and poisoning, and when pooling across all four scenarios.

Initially, the food taboo result seems in line with work in cognitive neuroscience, which has shown that WEIRD subjects consider intentions less when judging purity violations compared to harms (Chakroff et al., 2016; Dungan & Young, 2019; Young & Saxe, 2011). For example, innocent intentions do not tend to mitigate harsh judgments of purity violations such as incest or the breaking of a food taboo; these judgments focus more on the bad outcome (Young & Saxe, 2011). Here, however, breaking a food taboo is generally judged quite *leniently* in societies with low kinship intensity, and analyses suggest that the severity of judgments increases with kinship intensity across both intention conditions (ß = 0.33, [–0.028, 0.68], $p = 0.07$).[3] Interestingly, this finding is consistent with recent work in economics showing that kinship intensity predicts the moral relevance of purity. Using data from the Moral Foundations Questionnaire, Enke (2019) found that when deciding whether an act is right or wrong, people from societies with intensive kinship are more likely to consider whether the act violated purity standards than are people from societies with loose kin ties. The result for food taboos may be partially driven by this effect. However, it is also possible that the breaking of a food taboo was not a highly salient purity violation in our lower-kinship-intensity samples. If people did not think that breaking a food taboo constituted an important violation, then their judgments would be lenient regardless of the actor's intent.

Similarly, the relatively weaker interaction between kinship intensity and intent condition on the severity of judgments for the poisoning scenario may reflect the particularly wide-reaching effects of the poisoning scenario– many people in the community were sickened by the contaminated water supply. As shown in Figure 4, people in many societies appear to have shifted towards relatively more outcome-focused judgments of this poisoning scenario, levying harsher judgments on low-intent actors than in the other scenarios.

Our analysis of the mitigating factor data offers further support for the kinship intensity hypothesis. The results suggest that people in societies with more intensive kinship have a lesser

[3] Note that this coefficient is more precisely estimated and reaches statistical significance when society random intercepts are excluded from the model.

tendency to take mitigating factors into account when making moral judgments. Because considering a mitigating factor involves mentalizing (e.g., thinking about whether the perpetrator believed they had no other option), this finding further indicates that reliance on mental states in moral judgment declines with kinship intensity.

5. General Discussion

We have argued that some of the variation in the use of mental states in moral judgment can be explained as a psychological calibration to the social incentives, informational constraints, and cognitive demands of kin-based institutions, which we have assessed using our construct of kinship intensity. Our examination of ethnographic accounts of norms that diminish the importance of mental states reveals that these are likely common across the ethnographic record, while our analysis of data on moral judgments of hypothetical violations from a diverse sample of ten societies indicates that kinship intensity is associated with a reduced tendency to rely on intentions in moral judgment. Together, these lines of ethnographic and psychological inquiry provide evidence that (i) the heavy reliance of contemporary, WEIRD populations on intentions is likely neither globally nor historically representative, and (ii) kinship intensity may explain some of the population-level variation in the use of mental-state reasoning in moral judgment.

Although we use data from an experimental manipulation to assess people's reliance on mental states in moral judgments, our main empirical results for kinship intensity are correlational; accordingly, based on the current data, we cannot draw decisive causal inferences about the relationship between kinship intensity and the use of mental states in moral judgment. In addition, our sample size is small, especially given that our main predictor of interest varies at the society level. Nonetheless, against the background of a cohesive cultural evolutionary theory and much evidence from other aspects of psychology (Enke, 2019; Schulz et al., 2019), the results point to a promising avenue for further investigation.

Of course, demonstrating further that kinship intensity predicts intentionality in the eHRAF ethnographic sample would have bolstered our hypothesis; however, despite large effects in the expected directions, we lacked the statistical power in our small sample to substantiate these relationships with conventional levels of confidence.

Nonetheless, we note that several ethnographers have pointed to kin networks and relational mobility when seeking to understand the frequency of strict liability in small-scale societies. For example, Moore (1972) suggests that, in an interdependent community where ties cannot easily be broken, strict liability may be a means to assuage resentment or ameliorate social relationships harmed by a damaging act. This idea echoes the theory presented earlier, that reliance on intentions in moral judgment may be deemphasized in societies with intensive kinship and low relational mobility as a means to avoid conflict and maintain harmony.

One limitation of our work is that kinship intensity may be correlated with other society-level variables that may instead be driving the empirical patterns we observe. Short of finding a natural experiment, the only way to address this issue is to systematically pose and test theoretically well-grounded hypotheses. In the Supplement, we take a small step in this direction by showing that measures of ecological risk cannot account for our results. Rural-urban differences present another potential confound. Given that many features of life may vary

between rural and urban settings, some of which have been tied to psychological variation (Komiya, Oishi, & Lee, 2016; Milgram, 1970; Yamagishi, Hashimoto, Li, & Schug, 2012), it is possible that differences in urbanization could influence the use of mental states in moral judgment. We note, however, that nearly the entire sample of societies in Barrett et al.'s (2016) study is rural, including mostly small villages and camps. Removing the one urban site, Los Angeles, from the analysis has little impact on the results (Supplement S7.6). For example, pooling across all Intention vignettes, the significant, negative interaction between KII and intention condition on severity of moral judgment barely changes when Los Angeles is excluded (ß = –0.30 [–0.40, -0.21], $p < 0.001$) compared to when it is included (ß = –0.30 [–0.39, –0.22], $p < 0.001$). Though Los Angeles represents only a single urban site, this consistency suggests that rural-urban differences cannot account for the observed patterns in moral judgment, at least in this sample.

Alternatively, given that formal schooling has been linked to the early development of theory of mind (Kuntoro, Saraswati, Peterson, & Slaughter, 2013; Vinden, 1999, 2002; Wang, Devine, Wong, & Hughes, 2016), it is not implausible that schooling could influence the use of intentions in moral judgment. However, while schooling may independently influence this aspect of psychology, we think that it is unlikely to underlie our results for three reasons. First, prior work investigating the impact of kinship intensity on other features of psychology has held schooling constant– sometimes comparing undergraduates from around the world– yet has still found large effects of kinship intensity (Enke, 2019; Schulz et al., 2019). Second, specifically with regard to research on the use of mental states in moral judgments, vignette studies comparing the well-educated populations in Japan and the U.S. reveal noteworthy differences (Hamilton & Sanders, 1992). Formal schooling cannot explain these patterns. Finally, while we have not integrated formal schooling data into our analysis, the broad patterns across the sample of societies suggest that this will not matter. Anchoring one end of our kinship intensity distribution, the Yasawans and Sursurunga on average spend longer in school (modes of 9 and 6 years, respectively) and give less attention to intent than either the Hadza or Himba, both of whom have lower kinship intensity and rarely attend more than 2-3 years of school.

Our results suggest fertile ground for future research into the cultural evolution of intentionality in moral judgment. Beyond further testing of the causal link between kinship intensity and reliance on intentions, future work should examine the cultural evolutionary mechanisms that we have hypothesized to explain this relationship in Section 2.2: (1) the costs and benefits of partner choice, (2) the maintenance of community harmony, and (3) making inferences about the mental states of more socially distant individuals (intergroup psychology). In addition, as the sample of societies with data on mentalizing in moral judgment grows, ongoing work should examine which dimensions of kinship intensity have the largest impact (e.g., cousin marriage or clans?). Future studies should also exploit regional variation in kinship intensity within individual countries such as Italy (Alesina & Giuliano, 2014; Schulz et al., 2019) and the United States. Although patterns of kinship intensity in the US cannot be cleanly linked to urbanization (Lee & Cassidy, 2019), it is possible that kin-based institutions may be more intensive in parts of the rural US. Future work should examine whether these regional differences are associated with variation in the use of mental states in moral judgment. Moreover, studies should investigate whether the tendency to integrate information about mental states into moral judgment varies depending on the *type* of mental state in question (e.g. jealousy versus goodwill). Finally, future

work should examine the factors beyond kinship intensity that may contribute to variation in reliance on mental states in moral judgment, and in particular, formal schooling.

More broadly, this research lays a path for investigation into the cultural evolution of diverse conceptions of the mind. Ethnographic work suggests that there is substantial variation in how people in different societies conceive of the mind (Luhrmann et al., 2011). Here, we have built a cultural evolutionary framework for understanding a small sliver of this diversity. Moving forward, to make sense of how and why conceptions of the mind– and related psychologies– vary cross-culturally, we must carefully consider how culturally evolving beliefs, norms, and institutions direct, hone, and mold these features.

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Data Availability

The data associated with this research are available at:
https://osf.io/65krf/?view_only=bf6e60c9934e4b1f9bd0f25d40e6b568

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Competing Interests

We declare no conflicts of interest.

Table 2. Selected ethnographic examples of strict liability

Society	*Country*	*Subsistence*	*Strict Liability*	*References*
Albanians	Albania	Intensive Agriculturalist	*Intermediate* - After an accidental murder…honor was in most places satisfied by a money payment. For example, two men of Krujë were examining a revolver together, not knowing it was loaded, when it went off suddenly and killed one of them. The other was held guilty of murder, but in view of the circumstances escaped with a payment of twenty-five napoleons, the conventional six purses.	Hasluck & Hutton (1954), p.239
Berbers of Morocco	Morocco	Agro-Pastoralist	*Present* - During the hegemony of Abd el Krim, the preceptor of Ajdir once cut off the end of the gland of a child he was circumcising. If it had not been for the intervention of Abd el Krim, who assessed five hundred dollars blood money, the preceptor would surely have been killed, since the child died shortly after the accident.	Coon (1931), p. 130
Eastern Toraja	Indonesia	Horticulturalist	*Intermediate* - If an injury not inflicted on purpose resulted in the death of the injured person, the close relatives might well have demanded the death of the perpetrator, but we know of no cases where this demand was accepted. The imprudent person paid a fine... Of two men who spent the night on an eel-bridge, one cut the other one in the leg because he thought it was an eel. The injured man bled to death, and the perpetrator paid two buffaloes as *gompate* [fine].	Adriani & Kruijt (1950), p. 323
Gikuyu	Kenya	Intensive Agriculturalist	*Present* - Murder and manslaughter were treated in the same way, for the kiama was not chiefly concerned with the motive of the crime or the way in which the crime was committed, but with the fact that one man had taken another man's life.	Kenyatta (1953), p. 227
Goajiro	Colombia	Pastoralist	*Present* - Murder, manslaughter and being the cause of another's death are the most serious crimes. They do not have these actual categories.	Bolinder (1957), p. 100
Igbo	Nigeria	Horticulturalist	*Intermediate* - If it appeared that the homicide had been accidental, the man-slayer might… be allowed to return after twenty-eight days, and on his return would be required to offer sacrifice to Ala [earth deity]. But in some communities there was no difference in the penalty for accidental homicide and murder, owing to the belief that if a man killed another by what we should term an accident he must at some previous time have committed an act abominable to Ala.	Meek & Lugard (1970), p. 210

Ingalik	Alaska	Complex Hunter-Gatherer	*Present* - When one person is killed by another, whether by foresighted intention or in a burst of passion, or even by accident, revenge may be carried out by any capable individual in the relationship of father, son, brother, or either uncle of the deceased.	Osgood (1958), p. 53
Innu	Canada	Complex Hunter-Gatherer	*Present* - A distinction between murder—the premeditated and deliberate killing of a human being—and manslaughter—the killing without prepense—is unknown to these Indians. Even the accidental killing of another person as the result of a quarrel is regarded as homicide.	Lips (1947), p. 470(A)
Kazakh	Kazakhstan	Pastoralist	*Intermediate* - For unpremeditated murder wergeld is not customary, but only a gift of clothing and covering the expenses for burial and memorial services… [In self-defense] if the defender strikes the attacker, even though unintentionally, and it results in death or injury to a part of the body, the person guilty of this pays wergild.	Grodekov & Krader (1889), p. 210
Nivkh	Russia	Complex Hunter-Gatherer	*Present* - [Blood vengeance] is obligatory not only in the case of premeditated murder, but for completely accidental murder as well, even one which is only indirectly connected with one or another person.	Shternberg et al. (1933), p. 150
Northern Paiute	United States	Complex Hunter-Gatherer	*Present* - In the memory of informants no revenge killings took place, and informants stated that the payment of blood money is the most usual type of settlement for murder. Wergild is also demanded in case of accidental homicide and it is more likely to be accepted than in cases of murder.	Whiting (1950), p. 77
Suku	Democratic Republic of Congo	Horticulturalist	*Present* - A homicide must be compensated with the payment of two slaves, regardless of whether it was accidental or premeditated...There is no place, in this system, for arguments over the amount of compensation… nor over such matters as premeditation or accident, for these are legally irrelevant and compromise cannot take place in these terms.	(1) Kopytoff (1961), p.63
Yi	China	Intensive Agriculturalist	*Present* - When Li-ch'ü Ta-i accidently killed the son of Li-ch'ü Pieh-t'u… The clansmen decided that Ta-i would have to pay with his life. Reluctantly, Ta-i accepted the decision and twice attempted suicide without success. It was only after Pieh-t'u's sudden death that no one would press for the forfeit of Ta-i's life.	Lin & Pan (1947), p.107

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Supplemental Materials for

Kinship intensity and the use of mental states in moral judgment across societies

These Supplemental Materials contain three main parts. The first part (**Part I**) contains more detailed methods and additional analyses for the ethnographic review of strict liability and collective guilt. The second part (**Part II**) expands on the methods and results for the analysis of the cross-cultural experimental dataset on moral judgment. Finally, (**Part III)** provides brief background on theory of mind in humans.

Table of Contents

Part I. Ethnographic review of strict liability & collective guilt

This section of the Supplemental Materials provides details on the methods, analyses, and results for the ethnographic review of strict liability discussed in the Main Text. Under strict liability, motives, intentions, and other mental states play a diminished role in determining culpability; instead, outcomes are the central– and sometimes only– focus (Moore, 1972; Posner, 1980)

In addition, this section presents methods, analyses, and results of an ethnographic review of a second norm of legal liability. Alongside strict liability, many ethnographers have noted the presence of "collective" or "corporate" guilt (Moore, 1972; Posner, 1980). Here, liability extends beyond the guilty individual, infecting his or her extended kin group as well. Although this represents a less clear-cut case than strict liability, collective guilt may also suggest a lack of attention to mental states. Here, the person punished may have had nothing whatsoever to do with the harm— their mental states have no impact on their liability or the extent of their punishment. Of course, collective guilt is distinct from strict liability, and does not imply that moral judgments are necessarily outcome-focused. However, because of the disregard for the mental states of the person being punished, norms of collective guilt may also deemphasize mentalizing.

Reasoning that the presence of strict liability and potentially collective guilt may be indicative of a reduced tendency to consider mental states during moral judgment, we conducted an ethnographic review of these norms in order to gain a better understanding of how common this tendency might have been in the global and historical spectrum. In addition, by linking our ethnographic data to kinship variables in the *Ethnographic Atlas*, we tested the hypothesis that higher kinship intensity is associated with an increased probability of a society having norms of legal liability that deemphasize mental states.

S1. Ethnographic review methods

S1.1 The sample

We utilized the Standard Cross-Cultural Sample (SCCS) cases present in the electronic Human Relations Area Files (eHRAF, ehrafworldcultures.yale.edu). The SCCS was designed to minimize Galton's problem, including maximally diverse societies from around the world (Murdock & White, 1969). Today, there are thousands of variables coded for the SCCS societies, including several on kinship practices. The eHRAF database contains high quality, digitized ethnographic sources for 146 out of the 186 societies in the SCCS; documents that are considered a match for the era and location of the SCCS data are marked with "S1" (direct match), "S2" (partial match), or "S3" (ambiguous match) in the eHRAF search results. We included all three classes of matches in our review.

S1.2 Search and coding methods

Initial exploration in eHRAF revealed that several search terms tended to identify paragraphs relevant to strict liability and collective guilt that a search on the Subject "liability" alone did not. Therefore, we conducted a search for the Subject "liability" (Outline of Cultural Materials code 672), as well as the Keywords "accident", "murder", and "responsibility".

The sample was divided between two independent coders, who reviewed each paragraph produced by the search (n = 4,706). For their half of the sample, coders pulled relevant excerpts from the results and saved them in a database. Based on the information contained in the texts, coders rated each society for the presence of strict liability and collective guilt, as well as for their degree of confidence in their decision. After this first round, the coders swapped databases and recoded the excerpts. During this phase, the first coder's ratings were removed in order to avoid biasing the second coder's decision. Finally, the two coders' ratings were compared, and all disagreements adjudicated to generate the final data set.

For strict liability and collective guilt, each society was coded as follows: -1 (not enough data), 0 (evidence of absence), 0.5 (intermediate), or 1 (present). During initial coding, the meaning of "intermediate" (0.5) generally referred to cases with conflicting data; during adjudication, an additional definition emerged for each practice. For strict liability, a value of 0.5 can indicate that accidental perpetrators are held liable and punished, but the punishment is not as harsh as it would be for an intentional perpetrator. So, people clearly take intentions into account to some degree, but accidental wrongdoers still face a significant punishment. In a common example, an accidental killer is not subject to blood vengeance, but still must pay a very steep blood price. For collective guilt, a value of 0.5 can indicate that there is a strong preference for punishing the guilty individual, but family can also be punished in their stead. In some cases, this manifests as either a very harsh punishment for the responsible individual (e.g. blood vengeance) or a less harsh punishment for family members (e.g. blood price).

S2. Ethnographic review coder agreement & adjudication results

Overall inter-rater reliability for societies coded as 0, 0.5, or 1 was moderate (n = 42, 64% agreement for strict liability and n = 72, 76% agreement for collective guilt). Looking at only societies for which both coders were confident about their ratings, inter-rater reliability was much better (n = 20, 95% agreement for strict liability, n = 43, 91% agreement for collective guilt). Most disagreements involved a rating of 0.5 (intermediate) by one coder, and in several cases one coder believed there was not enough information (-1). During adjudication, the coders failed to agree on the appropriate rating of 4 societies for strict liability and 1 society for collective guilt; these cases were recoded to "-1 (not enough data)". Of the full sample of 146 societies, the final data set contains data (a rating of 0, 0.5, or 1) for 38 societies for strict liability and 71 societies for collective guilt.

S3. Ethnographic review results & discussion

We find that societies with strict liability (Figure S1A) and collective guilt (Figure S1B) are common and widespread across subsistence styles and regions of the world (Table S1). Of 38 societies with enough data to code strict liability, 42% (n = 16) clearly have the norms and 26% (n = 10) provide intermediate or less clear evidence. Similarly, for collective guilt, 63% (n = 45) of the 71 societies with enough data to code distinctly have the norms, and 9% (n = 6) represent intermediate or unclear cases. As Figure S1 and Table S1 illustrate, societies with strict liability and collective guilt occur across disparate regions of the world, from sub-Saharan Africa, to East Asia, to South America, and can be found in hunter-gatherers, horticulturalists, pastoralists, and agriculturalists. As suggested above, having collective guilt does not necessarily imply having strict liability: of societies with data on both practices, only 48% of those with collective guilt

also had strict liability. Table S2 shows a sample of ethnographic excerpts from some of the societies with strict liability and collective guilt.

Table S1. Societies with strict liability and collective guilt across subsistence style

	Number of Societies with Practice		
Subsistence Style	*Strict Liability*	*Collective Guilt*	*Either*
Mobile Hunter-Gatherers	1 (2)	4 (5)	4(5)
Complex Hunter-Gatherers	7 (11)	10 (22)	13(22)
Horticulturalists	1 (6)	10 (14)	10(14)
Pastoralists	4 (5)	6 (8)	6(8)
Intensive Agriculturalists	3 (10)	12 (17)	12(18)
Other Combinations	0 (4)	3 (5)	3(6)
Total	16 (38)	45 (71)	48(73)

Notes: Societies in the SCCS were rated for presence of strict liability and collective guilt based on ethnographic texts from eHRAF. This table shows the subsistence style of societies where there is evidence of presence of strict liability, collective guilt, or either of these two practices. The number in parentheses indicates the total number of societies with data on the practice (present, intermediate, or absent). Data on subsistence style comes from eHRAF. The category "Pastoralists" includes societies defined as "Pastoralist" or "Agro-pastoralist" by eHRAF, and the category "Other Combinations" includes the eHRAF classifications "Other Subsistence Combinations" and "Commercial Economy". Societies classified in eHRAF as "Hunter-Gatherers" or "Primarily Hunter-Gatherers" were divided into "Mobile" and "Complex" hunter-gatherers based on 5 SCCS variables: food storage, mobility, local hierarchy, community size, and presence of lineages. See Supplement S4 for more details.

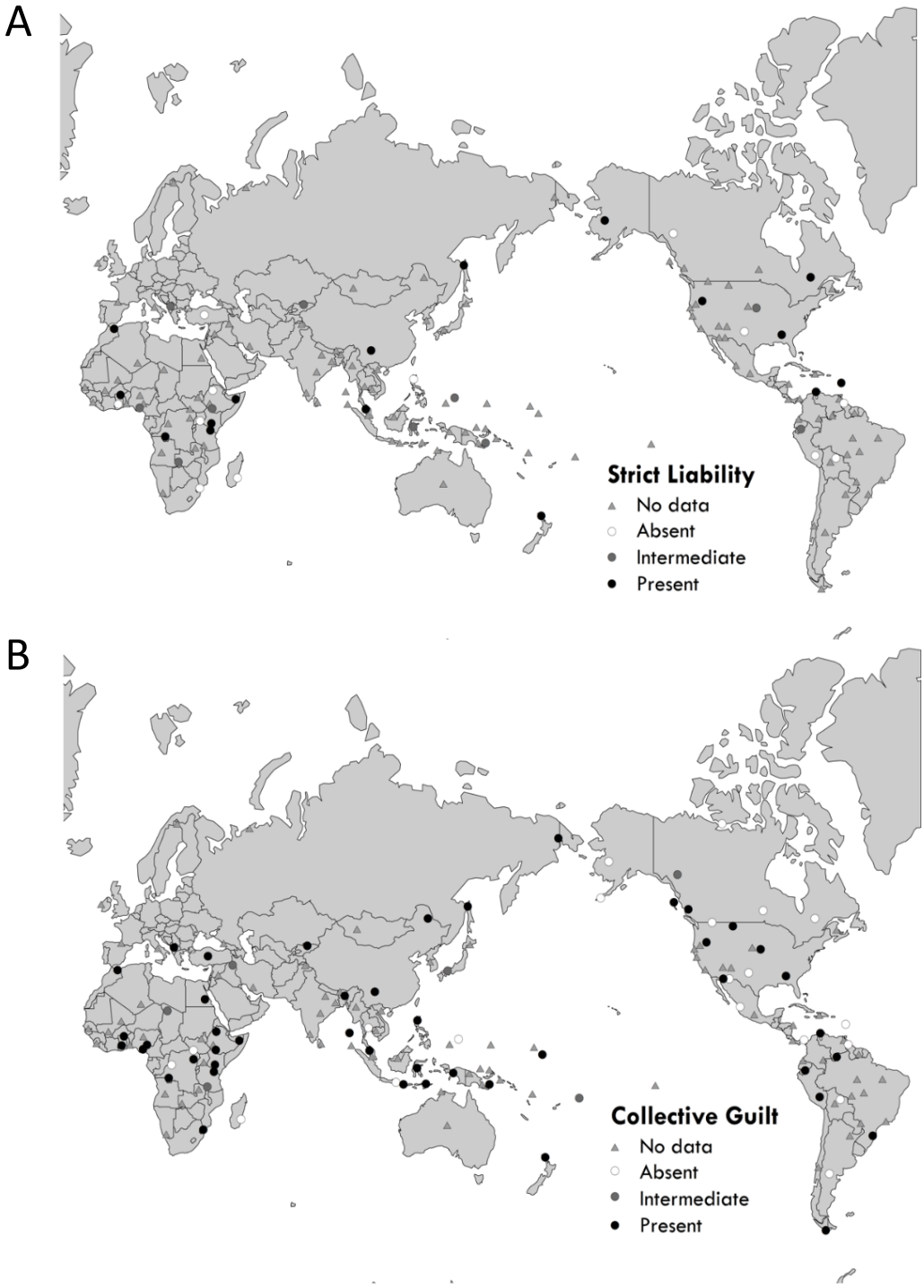

Figure S1. Strict liability **(A)** and collective guilt **(B)** are widespread in the eHRAF Standard Cross-Cultural Sample. **(A)** In the 38 societies with evidence of absence or presence of strict liability, strict liability is present in 42% (*n* = 16), intermediate in 26% (*n* = 10), and absent in 32% (*n* = 12). Societies with strict liability appear in regions around the world. 108 societies did not have enough relevant data to judge presence or absence of strict liability. **(B)** In the 71 societies with evidence of absence or presence of collective guilt, collective guilt is present in 63% (*n* = 45), intermediate in 9% (*n* = 6), and absent in 28% (n = 20). Societies with collective guilt appear in regions around the world. 75 societies did not have enough relevant data to judge presence or absence of collective guilt.

Table S2. Selected ethnographic examples of strict liability and collective guilt

Society	*Country*	*Subsistence*	*Strict Liability*	*Corporate Guilt*	*References*
Albanians	Albania	Intensive Agriculturalist	*Intermediate* - After an accidental murder…honor was in most places satisfied by a money payment. For example, two men of Krujë were examining a revolver together, not knowing it was loaded, when it went off suddenly and killed one of them. The other was held guilty of murder, but in view of the circumstances escaped with a payment of twenty-five napoleons, the conventional six purses. (1)	*Present* - In this group [the Dukagini] not only the man who has taken blood, but all the males of his "house," are liable for blood, so they, too, have to fly. The "house" is the home maybe of a whole family community—forty people. (2)	(1) Hasluck & Hutton (1954), p.239 (2) Durham(1928), p. 66
Akan	Ghana	Horticulturalist	*Not enough information*	*Present* – [All members of the group were] held by the offended party and his group to have been equally responsible for the injury committed, and all were thus likely to be made to suffer for it, unless they were prepared to refuse the demands of the injured party for justice and retribution, a course which would inevitably have resulted in fighting and in a general upheaval. (1)	(1) Rattray (1929), p. 290
Berbers of Morocco	Morocco	Agro-Pastoralist	*Present* - During the hegemony of Abd el Krim, the preceptor of Ajdir once cut off the end of the gland of a child he was circumcising. If it had not been for the intervention of Abd el Krim, who assessed five hundred dollars blood money, the preceptor would surely have been killed, since the child died shortly after the accident. (1)	*Present* - When one man murders another, whether or not in retaliation for a previous murder, the tribal council comes to his house, which it burns, providing it dares to. It cuts down the fruit trees and inflicts a fine of a thousand dollars. If the man and his *bone* [kingroup] refuse to pay the fine and resist the burning of the house or the cutting of the trees, the members of the tribal council attack them. (2)	(1) Coon (1931), p. 130 (2) Coon (1931), p. 104
Eastern Toraja	Indonesia	Horticulturalist	*Intermediate* - If an injury not inflicted on purpose resulted in the death of the injured person, the close relatives might well have demanded the death of the perpetrator, but we know of no cases where this demand was accepted. The imprudent person paid a fine... Of two men who spent the night on an eel-bridge, one cut the other one in the leg because he thought it was an eel. The injured man bled to death, and the perpetrator paid two buffaloes as *gompate* [fine]. (1)	*Present* - The death penalty was used first of all as blood revenge for murder. It made a great difference whether the murderer was from a different tribe than the murdered person, or whether both were from the same tribe, but from different kin groups. In the first case blood revenge was applied in full scope, whereby not only the murderer was sought, but the members of the kin group, the fellow tribesmen of the murderer. (2)	(1) Adriani & Kruijt (1950), p. 323 (2) Adriani & Kruijt (1950), p. 318

Gikuyu	Kenya	Intensive Agriculturalist	*Present* - Murder and manslaughter were treated in the same way, for the kiama was not chiefly concerned with the motive of the crime or the way in which the crime was committed, but with the fact that one man had taken another man's life. (1)	*Present* - The first step in a murder case was that the family group of the murdered man took up arms and invaded the murderer's homestead with the object of killing the murderer or one of his close relatives... If the invaders succeeded in killing the murderer or one of his kinsfolk, the case was settled there and then, for the two lives were considered equal. (1)	(1) Kenyatta (1953), p. 227
Goajiro	Colombia	Pastoralist	*Present* - Murder, manslaughter and being the cause of another's death are the most serious crimes. They do not have these actual categories. (1)	*Present* - The prohibition to join up with boys of another clan develops also from the fact that if a boy is invited to join another group and some accident should occur, the responsibility will fall on the group of the boy who extended the invitation. (2)	(1) Bolinder (1957), p. 100 (2) Gutiérrez de Pineda & Muirden (1950), p. 38
Igbo	Nigeria	Horticulturalist	*Intermediate* - If it appeared that the homicide had been accidental, the man-slayer might… be allowed to return after twenty-eight days, and on his return would be required to offer sacrifice to Ala [earth deity]. But in some communities there was no difference in the penalty for accidental homicide and murder, owing to the belief that if a man killed another by what we should term an accident he must at some previous time have committed an act abominable to Ala. (1)	*Present* - Another well-known feature is the collective responsibility of the extended-family, and to a lesser degree of the kindred, for the conduct of its members. The stock example of this is in cases of murder or manslaughter. Immediate retaliation was made by the kin of the murdered man on any member of the murderer's kin, and the property of the immediate relatives of the murderer was pillaged. (2)	(1) Meek & Lugard (1970), p. 210 (2) Meek (1970), p. 126
Ingalik	Alaska	Complex Hunter-Gatherer	*Present* - When one person is killed by another, whether by foresighted intention or in a burst of passion, or even by accident, revenge may be carried out by any capable individual in the relationship of father, son, brother, or either uncle of the deceased. (1)	*Absent* - A man who has committed a murder must go into the corner of the kashim for twenty days for purification. (2) [A] man who kills a shaman must sit in the corner under the bench for three or four days…it is believed that at the end of this period he will commit suicide. (3)	(1) Osgood (1958), p. 53 (2) Osgood (1958), p.127 (3) Osgood (1958), p. 55
Innu	Canada	Complex Hunter-Gatherer	*Present* - A distinction between murder—the premeditated and deliberate killing of a human being—and manslaughter—the killing without prepense—is unknown to these Indians. Even the accidental killing of another person as the result of a quarrel is regarded as homicide. (1)	*Absent* - The kin feeling among the Naskapi is not strong enough to develop into a regular blood feud. Revenge for the murder is essential; and the murderer himself—not one of his kin—must be the victim of retaliation. (1)	(1) Lips (1947), p. 470(A)

Kazakh	Kazakhstan	Pastoralist	*Intermediate* - For unpremeditated murder wergeld is not customary, but only a gift of clothing and covering the expenses for burial and memorial services… [In self-defense] if the defender strikes the attacker, even though unintentionally, and it results in death or injury to a part of the body, the person guilty of this pays wergild. (1)	*Present* – [T]he individual finds defense only in his clan. The clan answers for his transgressions. The propitiatory oath is imposed not on the responsible individual but on another person from his clan... When wergeld is not paid, not necessarily the murderer, but any person from his clan is killed.	(1) Grodekov & Krader (1889), p. 210 (2) Grodekov & Krader, (1889), p. 11
Nivkh	Russia	Complex Hunter-Gatherer	*Present* - [Blood vengeance] is obligatory not only in the case of premeditated murder, but for completely accidental murder as well, even one which is only indirectly connected with one or another person. (1)	*Present* - Every murder, intentional or unintentional, calls for clan vengeance. The closest clansman of the murdered man… must, in the figurative expression of the Gilyak, "raise up the kindred bones", i.e., kill the murderer or at least some person of the male sex of his khal'. (2)	(1) Shternberg et al. (1933), p. 150 (2) Shternberg et al. (1933), p. 507
Northern Paiute	United States	Complex Hunter-Gatherer	*Present* - In the memory of informants no revenge killings took place, and informants stated that the payment of blood money is the most usual type of settlement for murder. Wergild is also demanded in case of accidental homicide and it is more likely to be accepted than in cases of murder. (1)	*Present* - If, for example, a man kills another man he can expect that the murdered man's brother, parents, sister, or first cousin will kill him or a member of his family. (1)	(1) Whiting (1950), p. 77
Suku	Democratic Republic of Congo	Horticulturalist	*Present* - A homicide must be compensated with the payment of two slaves, regardless of whether it was accidental or premeditated...There is no place, in this system, for arguments over the amount of compensation… nor over such matters as premeditation or accident, for these are legally irrelevant and compromise cannot take place in these terms. (1)	*Present* - Obligations contracted by any member bind the lineage as a whole; individual transgressions become the responsibility of all the members. (2)	(1) Kopytoff (1961), p.63 (2) Kopytoff (1964), p.91
Yi	China	Intensive Agriculturalist	*Present* - When Li-ch'ü Ta-i accidently killed the son of Li-ch'ü Pieh-t'u… The clansmen decided that Ta-i would have to pay with his life. Reluctantly, Ta-i accepted the decision and twice attempted suicide without success. It was only after Pieh-t'u's sudden death that no one would press for the forfeit of Ta-i's life. (1)	*Present* - Any injury to the individual is considered an offense to the clan. So if one of its members is killed, the clan organization would come forward for vengeance by killing a member of the opposite group to atone for the death. (1)	(1) Lin & Pan (1947), p.107

S4. Kinship intensity and the presence of strict liability & collective guilt

We selected the SCCS cases in eHRAF for our ethnographic review in part because of the possibility of linking the data on strict liability and collective guilt to a measure of kinship intensity calculated from SCCS variables. We hoped that this would allow us to test the relationship between kinship intensity and the presence of norms of legal liability that deemphasize mental states. If this relationship emerged, it would provide further evidence to bolster the theory that the variation in the use of intentions in moral judgment can be explained by kinship intensity. Following the methods of Schulz et al. (2019, see section S1.1 in their Supplement), we generated a Kinship Intensity Index for each society in the eHRAF ethnographic review sample. We then employed several different analysis approaches to assess the relationship between kinship intensity and the presence or absence of these practices. Although the results trended in the expected direction, we failed to find a significant relationship between kinship intensity and the presence of strict liability or collective guilt in the ethnographic sample. However, given the very small sample size (which limited our ability to include important controls in the models) as well as the potential sources of bias in the ethnography, these null results are not surprising.

S4.1 Measuring kinship intensity in the Standard Cross-Cultural Sample

In order to create a measure of kinship intensity for the societies in this ethnographic review sample, we followed the methods laid out by Schulz et al. (2019, see section S.1.1 of their Supplement). In brief, we downloaded SCCS data on cousin marriage preference (EA 026), polygamy (EA 009), co-residence of extended families (EA 012 & EA 008), lineage organization (EA 043), and community organization (EA 015) from D-Place (www.d-place.org) and coded them according to the scheme provided by Schulz et al. (2018). See S6.1 below for a discussion of why these variables are relevant to kinship intensity. These 5 kinship sub-indicators were then standardized and averaged in order to create a Kinship Intensity Index.

S4.2 Data analysis

First, we employed Multinomial Logistic Regression (R package nnet, version 7.3-12) to analyze the relationship between kinship intensity and the presence of strict liability or collective guilt. In order to take the missing data into account, all four levels of the dependent variable (-1 = no data; 0 = absent; 0.5 = intermediate; 1 = present) were included in the models. In addition, to account for the fact that the 0, 0.5, and 1 categories are ordered, we dropped the missing data (-1) and reran the analysis as an Ordered Logistic Regression (R package MASS, version 7.3-51.5).

In an attempt to get more power in this analysis with small sample sizes, we employed several alternative approaches. First, we pooled societies coded as “intermediate” (0.05) with “absent” (0) and excluded societies with no data, then re-ran the analyses using binomial logistic regression.

In addition, because clans are particularly effective at fostering kinship intensity, we repeated these three approaches using the presence of clans as the main predictor instead of the kinship intensity index.

In some models, we included one of two measures of coding uncertainty as a covariate (dummy variables to indicate whether the coders disagreed in the first round of coding and whether the coders were uncertain about their final, adjudicated decision). Due to sample size constraints, we were unable to include other potentially relevant controls, such as subsistence style or levels jurisdictional hierarchy. Data analyses and visualizations were produced in R (version 3.5.2).

S4.3 Results & discussion

Using Multinomial Logistic Regression, we found a positive but imprecisely estimated relationship between kinship intensity and the presence of strict liability or collective guilt in this ethnographic sample. For example, for a 1 standard deviation increase in Kinship Intensity Index, the relative risk of observing strict liability compared to not observing strict liability is 1.36, but the confidence intervals are wide and include 1 (RR = 1.36, [95%CIs 0.62, 2.98], p = 0.44). As shown in Figures S2, there appears to be a very slight increase in predicted probability of strict liability (Panel A) or collective guilt (Panel B) being present as kinship intensity increases, but this effect is quite small, and the confidence intervals are broad. Including controls for coder uncertainty (indicating either whether the coders disagreed in the first round of coding or whether the coders were uncertain about their final, adjudicated decision) does not substantially alter the results. In addition, as kinship intensity increases, the likelihood of having missing data for strict liability appears to decline (Figure S2, Panel A, Column 4). This indicates that there is some bias in the sample, suggesting that we should be cautious in interpreting these data.

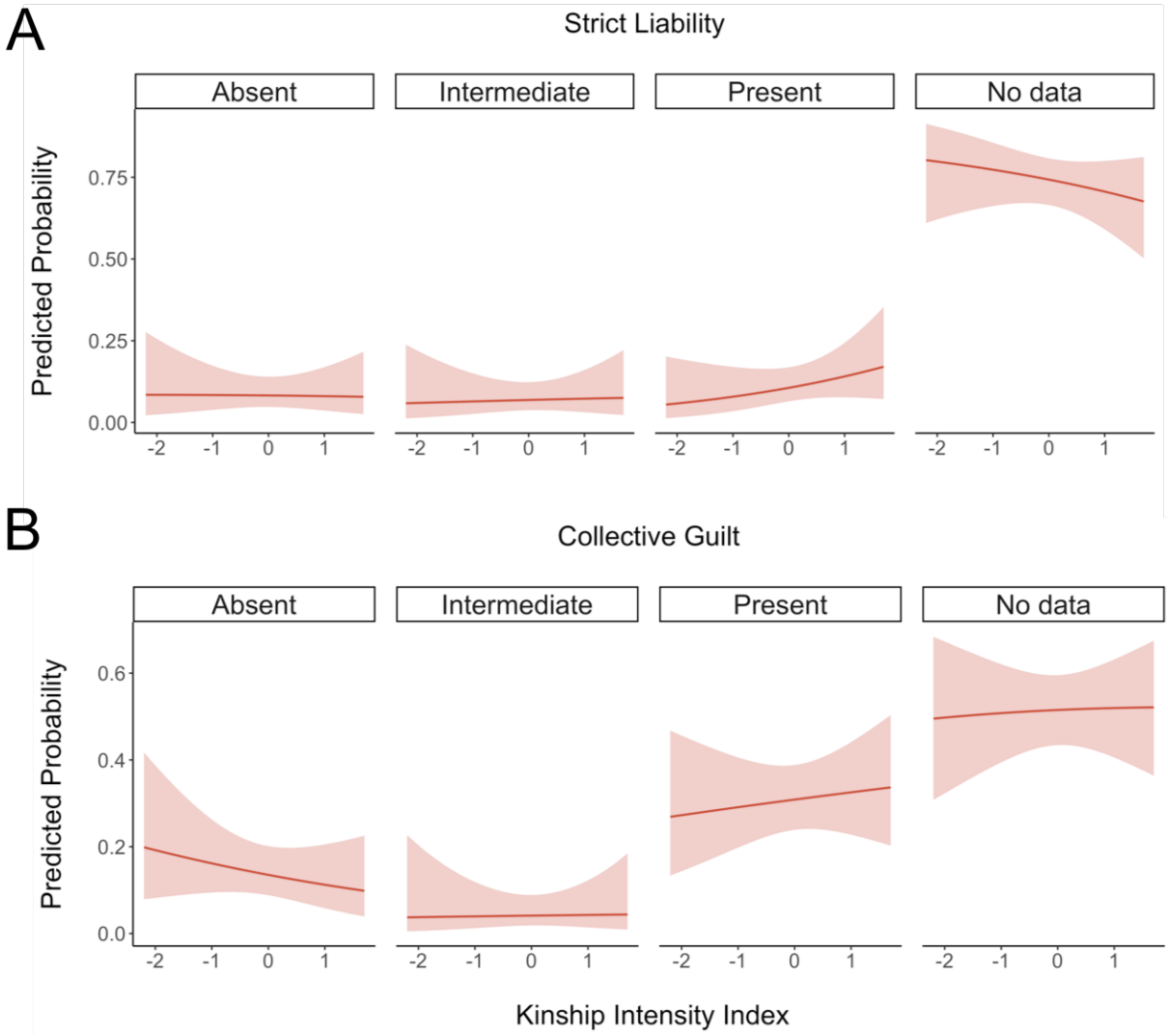

Figure S2. Predicted probability of observing four strict liability (**A)** and collective guilt **(B)** ratings (present, intermediate, absent, and no data) across kinship intensity. The predicted probabilities (shown with 95% CIs) reflect the results of a Multinomial Logistic Regression predicting coders' strict liability (**A)** or collective guilt **(B)** ratings on Kinship Intensity Index. Predicted probabilities across the four ratings sum to 1 at any particular Kinship Intensity Index value. The Kinship Intensity Index combines measures of cousin marriage preference, polygamy, co-residence of extended families, marital residence, and domestic organization.

Using the presence of clans instead of Kinship Intensity Index as the main predictor reveals large effects, but the confidence intervals remain vast, so uncertainty persists. For example, when moving from absence to presence of clans, the relative risk of observing collective guilt compared to not observing collective guilt is 6.21, but the confidence intervals are wide and include 1 (RR = 6.21, [95%CIs 0.74, 52], p = 0.093).

Using Ordered Logistic Regression (dropping the missing data) yields similar results to the Multinomial Logistic Regression. For example, a 1 standard deviation increase in Kinship Intensity Index is associated with a 40% increase in the odds of having more strict-liability-like practices ("intermediate" or "present", compared to "absent") (OR = 1.40, [95%CIs 0.69, 3.0], p = 0.35); however, the confidence intervals include 1. With clans as the predictor, Ordered Logit reveals more suggestive evidence that societies with more intensive kinship are more likely to have collective guilt. Moving from absence to presence of clans is associated with 778% increase in the odds of having more collective-guilt-like practices ("intermediate" or "present", compared to "absent") (OR = 7.78, [95%CIs 1.38, 146], p = 0.06).

We next tried pooling societies coded as "intermediate" and "absent" for strict liability or collective guilt and employing binomial logistic regression (Figure S3). As before, the odds ratios are over one– trending in the predicted direction– but the confidence intervals are wide, and the coefficients do not reach significance. A one standard deviation increase in kinship intensity index is associated with a 23% increase in the odds of having collective guilt (OR = 1.23, [95%CIs 0.74, 2.1], p = 0.42) and a 40% increase in the odds of having strict liability (OR = 1.40, [95%CIs 0.66, 3.2], p = 0.39); however, the confidence intervals contain 1.

Finally, using the presence of clans in place of the Kinship Intensity Index provides more suggestive support for the hypothesis that kinship intensity is associated with the presence of norms of legal liability that deemphasize mental states. Moving from absence to presence of clans is associated with a 355% increase in the odds of having strict liability (OR = 4.55, [95%CIs 0.83, 35], p = 0.099) and 709% increase in the odds of having collective guilt (OR = 8.09, [95%CIs 1.4, 153], p = 0.052). These odds ratios are large but remain only marginally significant at conventional level. This underlines the lack of power in our analysis.

Overall, these analyses provide suggestive support for our hypothesis. In almost every case, the effects of the KII on the reported presence of strict liability and/or corporate guilt go in the predicted direction, with magnitudes that are moderate to large; but, only occasionally are these coefficients well estimated by conventional standards. This persistent uncertainty is unsurprising for several reasons. First, the sample sizes are quite small, preventing the inclusion of potentially important covariates such as subsistence style and jurisdictional hierarchy beyond local community (often used as a measure of state development). Second, ethnographic data is messy, and there is substantial room for bias in the written ethnography, the availability of relevant ethnography, and the coding process. Third, data was missing from many societies, which may introduce biases if 'missingness' was not scattered essentially randomly with respect to the KII (which appears to be the case for strict liability, see Figure S2, Panel A, Column 4). Given these constraints, we believe that the results of the ethnographic review are best suited to simply providing a suggestion of how these practices may have been historically and globally distributed. All in all, although a significant relationship between kinship intensity and the

presence of strict liability or collective guilt would have bolstered the theory presented in this paper, the lack of significant findings does little to diminish the theory.

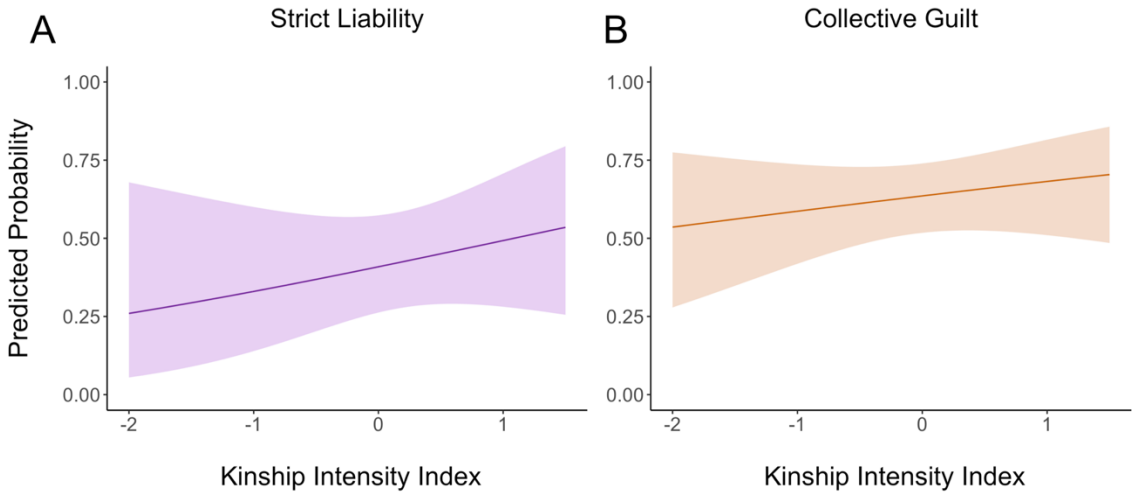

Figure S3. Predicted probability of observing strict liability **(A)** and collective guilt **(B)** across kinship intensity. The predicted probabilities (shown with 95% CIs) reflect the results of a Binary Logistic Regression predicting the presence of strict liability **(A)** or collective guilt **(B)** from Kinship Intensity Index. For this analysis, ratings of "intermediate" (0.5) were pooled with "absent" (0) and all societies with missing data were dropped. The Kinship Intensity Index combines measures of cousin marriage preference, polygamy, co-residence of extended families, marital residence, and domestic organization.

S5. Classifying hunter-gatherer societies as "mobile" or "complex"

Although kin-based institutions play an important role in social life across human societies, there is variation in the extent to which these institutions influence social organization. Among small-scale societies, mobile hunter-gatherers, who live in small, egalitarian, nomadic bands, tend to have more extensive kin ties than agriculturalists or pastoralists. For example, mobile hunter gatherers tend to have broad social networks, bilateral descent, and low levels of kin marriage and inbreeding (Schulz et al., 2019; Walker & Bailey, 2014).

"Complex" hunter-gatherers, on the other hand, may have more intensive kinship systems. Defining complex hunter-gatherers can be a challenge, but some common features include a more settled lifestyle, larger community sizes, food storage, hierarchical political organization, and corporate descent groups (Ames, 2014). The presence of corporate descent groups, such as lineages or clans, suggests that these hunter-gatherers may experience more intensive kin-based institutions than mobile hunter-gatherers. Therefore, in analyzing the distribution of societies in our ethnographic review with strict liability and collective guilt, we distinguished between "mobile" and "complex" hunter-gatherers.

S5.1 Methods

Drawing on Ames' (2014) discussion of complex hunter-gatherers, we selected 4 Standard Cross-Cultural Sample variables with which to quantify the complexity of hunter-gatherers: food storage (SCCS variable 21), settlement style (SCCS variable 234), size of the local community (SCCS variable 63), and jurisdictional hierarchy within local community (SCCS variable 236). To avoid a spurious correlation with our Kinship Intensity Index, which includes a variable related to corporate descent groups, we did *not* include a variable indicating the presence of corporate descent groups in our hunter-gatherer complexity analysis. SCCS data were downloaded from D-Place (d-place.org). For each respective trait, societies were coded as 0 if they were fully nomadic, lacked food storage, had local populations smaller than 50 people, and had local hierarchy at the level of "independent families" rather than "extended families" or "clan-barrios. Societies with two or more complex traits (coded as 1s) were classified as "complex hunter-gatherers"; those with 0 or 1 complex trait were classified as "mobile hunter-gatherers." We summed these 4 dummy variables to create a Hunter-Gatherer Complexity Index, ranging from 0 (completely mobile) to 4 (highly complex).

S5.2 Results & discussion

Among the hunter-gatherer societies in our ethnographic sample (n = 27), there is a significant correlation between the Hunter-Gatherer Complexity Index and the Kinship Intensity Index (r = 0.56 [95% CIs 0.24, 0.78], p = 0.002, Figure S4). This supports the idea that complex hunter gatherers tend to have more intensive kinship systems than mobile hunter-gatherers.

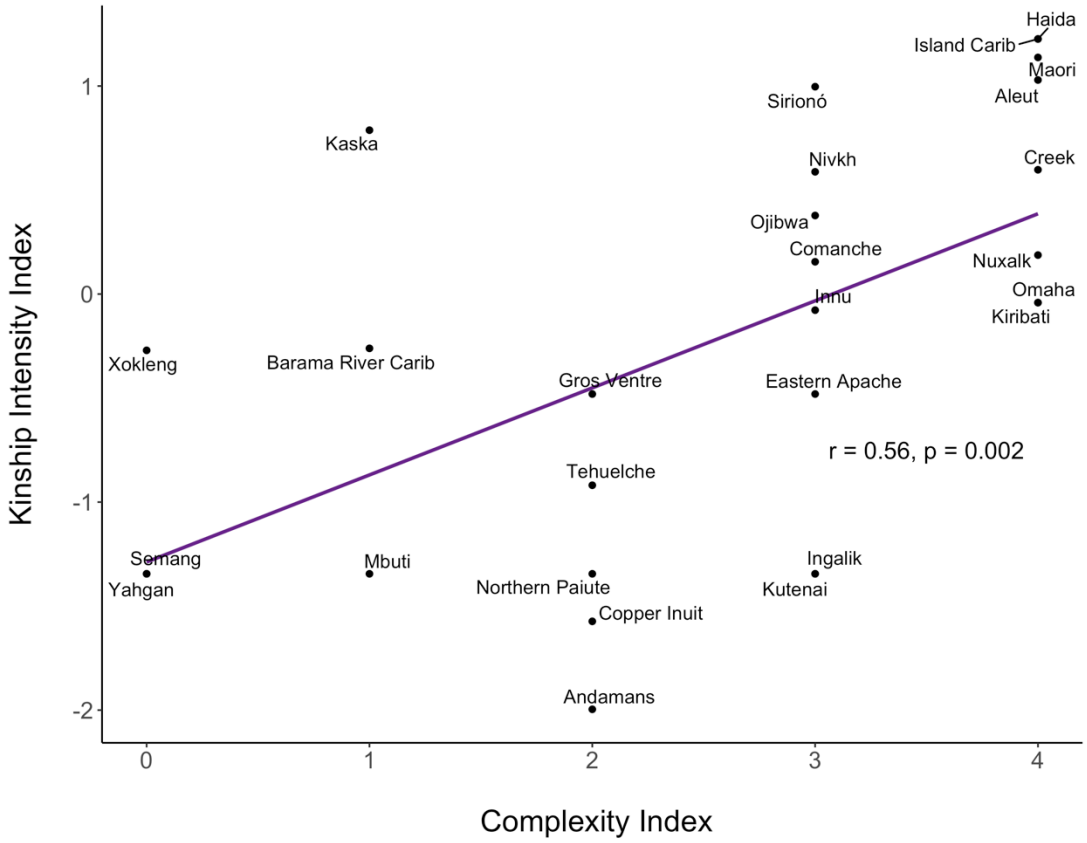

Figure S4. Hunter-gatherer complexity is positively correlated with kinship intensity in the eHRAF SCCS sample. The Hunter-Gatherer Complexity Index combines 4 measures used to distinguish between mobile and complex hunter-gatherers: food storage, mobility, community size, and local hierarchy. A low score indicates that the group is mobile; a higher score indicates increasing complexity. Following Schulz et al. (2019), the Kinship Intensity Index combines SCCS measures of cousin marriage preference, polygamy, co-residence of extended families, marital residence, and domestic organization. A low score indicates that the society has more extensive kinship, while a higher score suggests that the society has more intensive kinship.

Part II. Kinship intensity and intentionality in moral judgment across 10 societies

This portion of the Supplemental Materials expands on the methods & results for the analysis of the relationship between kinship intensity and use of mental states in moral judgment in the cross-cultural experimental sample from Barrett et al. (2016).

S6. Methods

S6.1 Measuring kinship intensity

Kin-based institutions are a central, organizing force of social life in human societies around the world. However, kin-based institutions do not have an equally firm grip on social organization across all societies; rather, the kinship intensity varies (see main text for discussion of the cultural evolution of kin-based institutions). To measure kinship intensity in the societies in the Barrett et al. (2016) sample, we designed an ethnographic Kinship Intensity Survey. The survey questions were based on *Ethnographic Atlas* questions about kinship practices: domestic organization, post-marital residence, cousin marriage, polygamy, descent pattern, corporate ownership of land, and presence of clans, segmentary lineages, and segmented communities. Each of these variables can enhance kinship intensity, and societies may reach intensive kinship through different pathways and combinations of these variables. Here we provide a brief description of each sub-indicator and its relevance to kinship intensity.

Domestic organization

Domestic organization describes the prevailing form of familial and household structure. On one end of the spectrum, families can be arranged in independent, nuclear units, each living in a separate household. On the other end of the spectrum, family units can be organized within large, extended family households. Here, multiple, overlapping nuclear families are linked, inhabiting a shared space (Murdock, 1949). For example, two married sons, along with their wives and children, may reside together in the same compound, or even the same house, as their father and mother. This close proximity and the frequent interaction that it entails promotes tight bonds between cohabiting family members, increasing kinship intensity.

Post-marital residence

Patterns of post-marital residence can have a similar effect. Societies tend to have a prevailing rule or preference regarding where couples live once they get married. Common patterns include: with or near the bride's parents (*matrilocal*), the groom's parents (*patrilocal*), or either family (*bilocal*), or in an independent location away from either family (*neolocal*) (Murdock, 1949). Matrilocal, patrilocal, or bilocal residence encourage kinship intensity by maintaining proximity and close ties between one spouse and his or her kin. In contrast, neolocal residence promotes more extensive kinship by placing couples in neighborhoods or communities away from blood relatives, where they are bound to form extensive ties with unrelated neighbors (Schulz et al., 2019).

Descent pattern

Descent pattern describes the prevailing mode of familial affiliation in a society: with which blood relatives does a person have reciprocal obligations of support? The affiliative relationships fostered by rules of descent dictate to whom a person should turn for help and to whom he owes support in a conflict. The most common patterns of descent link a child exclusively with his father's lineage (*patrilineal*), exclusively with his mother's lineage (*matrilineal*), or with some family members from both parents' lineages (*bilateral*) (Murdock, 1949). Unilineal (patrilineal or matrilineal) descent promotes kinship intensity by allying a person strongly with only one side of their family. Consider, for example, that the children of two brothers (parallel cousins) in a patrilineal society are both tightly affiliated with the same kin group. Bilateral descent, on the other hand, weakens kinship intensity by spreading out allegiances across two lineages; parallel cousins are only partially affiliated with the same kin group (Enke, 2019).

Cousin marriage

Marriage can be a key tool for expanding social networks, building extensive ties, and forging alliances with unrelated individuals and kin groups. When partners are unrelated, marriage creates affines, expanding the kin group to include both genetic and non-genetic relatives. However, when partners are related, affines are *also* genetic relatives. This reduces the overall number of ties and intensifies existing kin bonds. It also increases the degree of genetic relatedness within the family, which may encourage greater prosociality towards kin via kin selection. Finally, blood relatives are likely to experience similar socialization, increasing the probability that related couples will share similar norms and beliefs (Schulz et al., 2019). Societies differ in degree to which consanguineous marriage is considered permissible. While in some societies marriage between cousins is tabooed, in other societies cousins are preferred marriage partners.

Polygamy

Polygamous marriages– unions that involve one partner having more than one spouse– are widespread in the ethnographic record. By far the most common pattern involves a single husband with multiple wives (*polygyny*), although societies where women are permitted to have multiple husbands also exist (*polyandry*) (Murdock, 1949). Polygamy influences kinship intensity in several ways. First, polygamy tends to encourage the formation of extended family households, with multiple spouses and their children all inhabiting the same compound or same house. Second, because older, wealthier men take multiple wives, polygyny creates a large pool of young, unmarried men. These men tend to reside close to or with family until marriage, intensifying their kin ties and delaying the formation of extensive ties with affines (Schulz et al., 2019).

Clans (and other large kin groupings)

Beyond the immediate kin group or lineage– where kin relationships can be genealogically traced to a common ancestor– some societies have larger kin groupings. Here consanguineal relationships and shared bonds are recognized, even if the actual genealogical links remain unknown. In this case, a society is said to have *sibs*, each of which tends to contain several lineages. Sibs can be further aggregated into higher-order groupings called *phratries* or *moieties*. Because these larger kin groupings expand the extent of kin networks, alliances, and obligations,

they increase kinship intensity. *Clans* are a special case of higher-order kin grouping that promote even greater kinship intensity. Clans combine unilineal descent with residential unity (e.g. both patrilineal and patrilocal), while also promoting a feeling of membership and cohesiveness (Murdock, 1949).

Segmentary lineages

The segmentary lineage system is a kin-based institution that structures social relationships in a hierarchical, nodal-branching manner. Each individual belongs to a maximal patrilineage, and his ties and obligations to other members of the lineage depend on the genealogical depth of their most recent shared ancestor (Figure S5). Members within each grouping, or segment, of the system owe support to one another; in the case of a conflict between segment A and segment B, for example, all members of A must unite against all members of B. By creating tight affiliative bonds within hierarchically structured kin segments, segmentary lineage systems enhance kinship intensity.

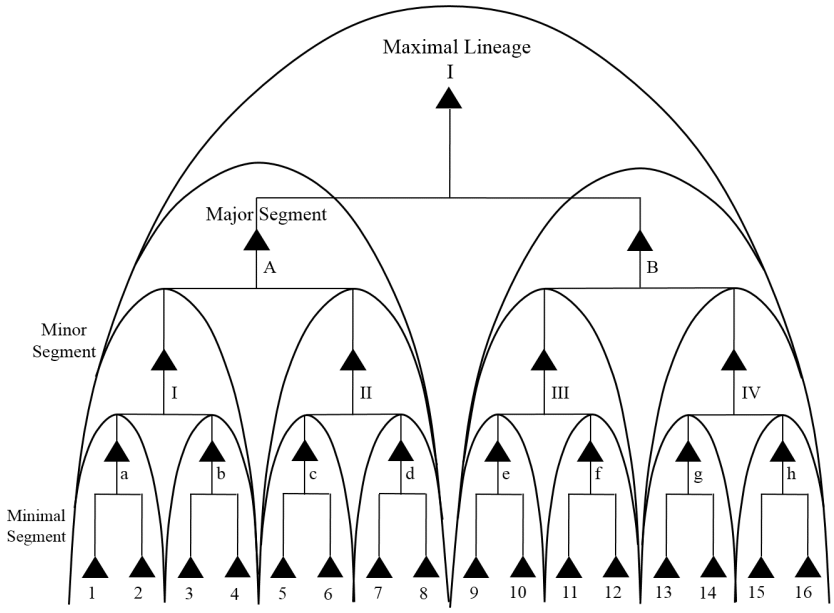

Figure S5. Diagram of the structure of a segmentary lineage system. Each individual belongs to a maximal patrilineage, and his ties and obligations to other members of the lineage depend on the genealogical depth of their most recent shared ancestor. Members within each grouping, or segment, of the system owe support to one another; in the case of a conflict between segment A and segment B, for example, all members of A must unite against members of B. Adapted from Moscona, Nunn, & Robinson (2020).

Segmented communities

In some societies, residence within communities is localized by kin group; communities are said to be *segmented* (Murdock, 1949). The presence of segmented communities increases kinship intensity by keeping kin groups spatially intact. When living in a segmented community, a person's neighbors are also their kin, fostering stronger kin ties and denser kin networks. In

contrast, in non-segmented communities, a person has non-related neighbors, promoting the formation of extensive ties.

Corporate ownership of land

Finally, the presence of land tenure collectively held by kin groups increases kinship intensity. Land, whether for hunting and gathering, grazing herd animals, or agriculture, can be either corporately owned by a group or divided into privately-owned tracts. When land is collectively owned by kin groups, this decreases residential mobility and encourages individuals to live with their kin in order to maintain access to the land necessary for subsistence. In addition, this system fosters interaction and dependence in kin groups that collectively manage and own land.

S6.2 Kinship Intensity Index

One ethnographer from each of Barrett et al.'s (2016) ten field sites filled out the Kinship Intensity Survey about kinship at their site. The ethnographers were blind to the purpose of the study and to the hypotheses. Ethnographers were asked to comment on both contemporary and traditional practices where applicable. Answers to these questions were used to create the Contemporary Kinship Intensity Index (referred to simply as the Kinship Intensity Index in the main text) and the Ancestral Kinship Intensity Index, respectively.

Three blind coders rated each of the survey responses for kinship intensity, from 0 (low intensity) to 1 (high intensity) according to the scheme presented in Table S3. There was no variation in the presence of age sets, so this variable was excluded from all analyses. Variables were coded continuously, to the extent possible. For example, if an ethnographer indicated that all members of the community live in independent nuclear households, the blind coder would code "Domestic Organization (Non-nuclear?)" as "0". In contrast, if everyone lived in an extended family household, this variable would be coded it as "1". If the ethnographer's response indicated that there was some mix of domestic organization in the community, coders were asked to use their best judgment to code a continuous value between 0 and 1. Some variables were coded as "0" when absent (cousin marriage, polygamy, corporate land ownership, clans, segmented communities, and segmentary lineages; see Table S3). When these features were present, a score above 0 was given. For example, if the ethnographer indicated that cousin marriage was preferred and very common, a high score (1 or near 1) was given. If it was present/allowed but not very common, coders were asked to use their best judgment to select a continuous value between 0 and 1.

Whenever an ethnographer provided information about both present and past practices, coders were asked to score "contemporary" and "traditional" practices separately. If timeframe was not specified, we assumed that this meant that the described practices reflect both contemporary and traditional practices (i.e., little temporal change). Therefore, in these cases, contemporary and traditional practices were coded identically (77% of cases).

A society-level Kinship Intensity Index was created by averaging across the 9 contemporary kinship measures. Kinship Intensity Index scores generated from the three blind coders were highly consistent (Intraclass Correlation Coefficient = 0.95, [95% CIs 0.86, 0.99]), and were averaged together to yield a single measure. Similarly, the Ancestral Kinship Intensity Index averages responses across the 9 ancestral kinship measures (coders' Intraclass Correlation Coefficient = 0.72, [95% CIs 0.41, 0.91]).

Table S3. The Kinship Intensity Survey coding scheme

		Kinship Intensity	
Survey Variable	*Description*	*Low Intensity*	*High Intensity*
Domestic organization	Prevailing form of domestic or familial organization	Independent nuclear families	Extended family households
Post-marital residence	Prevailing pattern of transfer of residence at marriage	Neo-local	Non-neolocal (e.g. patri-, matrilocal)
Descent pattern	Prevailing mode of familial affiliation	Bilateral	Unilineal (patrilineal, matrilineal)
Cousin marriage	Frequency and acceptability of marriage between cousins	Absent, forbidden	Common, preferred
Polygamy	Frequency and acceptability of marriage with >1 spouse	Absent, forbidden	Common, preferred
Corporate land ownership	Frequency of collective land tenure (e.g. by clans)	Absent	Common
Clans	Presence of clans, phratries, or other large kin groups	Absent	Present
Segmented communities	Residence localized by kinship (e.g clan barrios)	Absent	Present
Segmentary lineages	Kinship defined by relative position in hierarchical, branching segments	Absent	Present

Notes: One ethnographer from each of the ten field sites filled out the Kinship Intensity Survey, commenting on both contemporary and traditional practices when possible. Ethnographers were blind to the purpose of the study and to the specific hypotheses. Responses were rated for kinship intensity by three blind coders, according to this scheme. Variables were scored continuously where possible, especially when quantitative data was provided (for example, actual rates of cousin marriage). See S6.1 & S6.2 for more details on these variables and how they were coded.

S6.3 Severity of Judgment Index

The Severity of Judgment Index combines three measures of moral judgment about harms from Barrett et al.'s (2016) vignette study: badness ("In your opinion, how good or bad was what [Agent] did?"), punishment-worthiness ("In your opinion, do you think [Agent] should be rewarded or punished?"), and reputation-damaging effects ("When people discover what happened, what will people think of [Agent] — will they think he is a good person or a bad person?"). In Barrett et al.'s study, participants rated these measures on a scale from -2 (very good) to +2 (very bad). These moral judgment measures were highly internally consistent (Cronbach's $\alpha = 0.81$ [95% CIs 0.79 – 0.82]). To combine them into a single Severity of Judgment Index, we first ran a Principle Components Analysis on the three moral judgment measures. The first principle component (PC1) explained 72% of the variance. The loadings onto the 1st PC were then used as weights to generate the weighted sum of badness, punishment, and reputation judgments. In the final Severity of Judgment Index, a high value indicates harsh moral judgment and a low value indicated a lenient judgment.

S6.4 Ecological Risk

We also attempted to test what we call the Risk-Intentionality Hypothesis. Much research suggests that ecological risk, captured using temperature variation and environmental shocks, is associated with greater behavioral conformity, societal tightness and more adherence to tradition (Gelfand et al., 2011; Gelfand, Nishii, & Raver, 2006; Giuliano & Nunn, 2019; Harrington & Gelfand, 2014; Thomson et al., 2018). Given this, it's plausible that shifts toward greater behavioral conformity are accompanied by a shift away from monitoring of internal states and a greater focus on external actions and outcomes. Therefore, we tested whether the effects of KII hold up to the inclusion of ecological risk measures in the models. Importantly, these variables may be endogenous; prior work has linked ecological threats and shocks to cultural tightness (Gelfand et al., 2011) and low relational mobility (Thomson et al., 2018), both of which are related to kinship intensity. However, it is unclear exactly how these variables are ordered in the causal chain.

We collected several proxy variables aiming to capture different aspects of ecological insecurity. Unfortunately, direct measures from the 10 societies in the data set are unavailable. Instead, geographic data on mean annual temperature range and ecological risk variables (floods, droughts, earthquakes, and cyclones) were downloaded from the United Nations Global Agro-Ecological Zones data portal and Global Risk Data Platform, respectively. As a measure of seasonality, the mean annual temperature range (°C) was averaged over the area of a 50km radius from the location of each field site. As a measure of ecological risk, an Ecological Risk Index was created by combining Global Risk Data Platform's Multi-Hazard Index and a measure of drought frequency within the 50 km radius. The Multi-Hazard Index is an estimate of risk from floods, earthquakes and cyclones (Peduzzi, 2015). Drought frequency was calculated as the average number of drought events per year from the period of 1980-2001 (Peduzzi, 2015). These variables were standardized and combined into a single Ecological Risk Index (weighted sum: 0.75*Multi-Hazard Index + 0.25*Drought frequency). All geospatial analyses were conducted in ArcMap (version 10.5, Esri).

S6.5 Urbanization robustness check

Some evidence suggests that rural- urban differences can shape psychology (e.g. Komiya, Oishi, & Lee, 2016; Milgram, 1970; Yamagishi, Hashimoto, Li, & Schug, 2012). Many features of life may potentially vary between rural and urban settings, including market integration, levels of formal schooling, the presence of strangers, and relational mobility. It not implausible that reliance on mental states in moral judgment could also vary with urbanization. Although we do not have a strong, theoretically-grounded reason to expect this to be the case, we wanted to check that our results cannot be explained by rural-urban differences. Crucially, we note that all sites included in our sample, with the exception of Los Angeles, are rural. Therefore, it seems unlikely that the variation in the use of mental states in moral judgement could be explained by urbanization. Nonetheless, as a robustness check, we excluded Los Angeles from the data set and re-ran our main analyses on the sub-sample of 9 rural societies.

S6.6 The sample

Barrett et al.'s (2016) study included a diverse sample of ten societies, including eight small-scale societies and two Western societies. Taken together, the sample captures varied subsistence styles, languages, geographies, kinship intensities, and ecological risks. See Table S4 for sample characteristics.

S6.7 Data analysis

We employed Linear Mixed Effects Regressions (R package lme4, version 1.1-19) to analyze the results.

As described in the Main Text, for the Intention vignettes we examined each scenario separately (theft, physical harm, poisoning, and food taboo). To do this, we ran a single model that interacted scenario, Kinship Intensity Index, and intention condition on Severity of Moral Judgment Index. For vignette observation *v*, individual *i*, in society *s*:

$$\begin{aligned} MJ_{vis} = \beta_0 + \beta_1 Scenario_{vis} + \beta_2 Intent_{vis} + \beta_3 KII_s + \beta_4 (Scenario_{vis} \times Intent_{vis}) \\ + \beta_5 (KII_s \times Scenario_{vis}) + \beta_6 (KII_s \times Intent_{vis}) \\ + \beta_7 (Scenario_{vis} \times Intent_{vis} \times KII_s) + \theta_{is} + \omega_{is} + \varphi_s + \varepsilon_{vis} \end{aligned}$$

where:

- *MJ* is the Severity of Moral Judgment Index
- *Scenario* is a categorical variable indicating the vignette scenario (theft, physical harm, poisoning, or food taboo violation)
- *Intent* is a dummy indicating whether the vignette featured a high- or low-intent harm
- *KII* is the Kinship Intensity Index
- θ is a vector of individual covariates (age and sex)
- ω is an individual random intercept
- φ is a society random intercept
- ε is the error term

To examine the relationship between Kinship Intensity Index and intention condition on severity of moral judgment across all vignette scenarios (pooled), we removed the term $Scenario$ from the model:

$$MJ_{vis} = \beta_0 + \beta_1 Intent_{vis} + \beta_2 KII_s + \beta_3 (KII_s \times Intent_{vis}) + \theta_{is} + \omega_{is} + \varphi_s + \varepsilon_{vis}$$

For the ecological risk analyses, we include one of the two ecological risk variables (Ecological Risk Index or Mean Annual Temperature Range) in a four-way interaction, along with scenario, Kinship Intensity Index, and intention condition. We report the main output variables of interest in the tables below, omitting additional output variables for the sake of simplicity. The R code for the full results is available on OSF.

For the Mitigating Factors vignettes, we interacted Kinship Intensity Index and mitigating condition on Severity of Moral Judgment Index. Using the same notation as above:

$$MJ_{vis} = \beta_0 + \beta_1 Mitigating_{vis} + \beta_2 KII_s + \beta_3 (Mitigating_{vis} \times KII_s) + \theta_{is} + \omega_{is} + \varphi_s + \varepsilon_{vis}$$

All models include random intercepts for subjects and societies. All continuous variables were standardized.

Due to missing data on sex, one participant was removed from the analysis, leaving a total of 321 participants in the Intentions sample. Due to the structure of the Mitigating Factors vignette sets, only subjects who completed vignettes featuring self-defense and necessity also completed the control intentional vignette. This constrains our Mitigating Factors analysis to include only 147 subjects from 9 societies (no Mitigating Factors data were collected from Himba participants).

Data analyses and visualizations were produced in R (version 3.5.2). Data files and code are available on OSF.

Table S4. Barrett et al. (2016) cross-cultural sample characteristics

Society	*Country*	*Subsistence*	*N*	*% Male*	*Age range*	*Kinship Intensity*	*Ecological Risk*	*Temperature Range (°C)*
Hadza	Tanzania	Hunter-gatherer	29	59%	18-76	0.25	0.052	3.2
Himba	Namibia	Pastoralist	24	58%	19-67	0.55	-0.83	5.6
Karo Batak	Indonesia	Small-scale cultivators	31	49%	18-59	0.40	1.53	0.93
Los Angeles	USA	Urban	39	49%	19-54	0.013	0.66	12
Martu	Australia	Hunter-horticulturalist	18	44%	18-53	0.41	-0.71	16
Shuar	Ecuador	Hunter-horticulturalist	35	49%	18-58	0.20	0.97	1.6
Storozhnitsa	Ukraine	Rural-agriculturalist	28	26%	19-80	0.089	0.98	22
Sursurunga	Papua New Guinea	Horticulturalist	20	50%	18-60	0.66	-0.26	0.64
Tsimane	Bolivia	Hunter-horticulturalist	32	56%	18-66	0.22	-1.5	4.2
Yasawa	Fiji	Fishing-horticulturalist	66	47%	22-80	0.85	-0.91	4.2

Notes: *Kinship Intensity* refers to the Contemporary Kinship Intensity Index, which combines measures of current kinship practices: domestic organization, post-marital residence, cousin marriage, polygamy, descent pattern, corporate ownership of land, and presence of clans, segmentary lineages, and segmented communities. Possible values range between 0 (low intensity) and 1 (high intensity). *Ecological Risk* is a standardized index combining risk of droughts, earthquakes, floods, and cyclones. *Temperature Range*, a measure of seasonality, gives the mean annual range of temperatures in degrees Celsius.

S7. Results & discussion

S7.1 The effects of kinship intensity on the use of intention, pooling across vignette scenarios

When pooling across all vignettes (physical harm, poisoning, theft, and food taboo violations), Table S5 (Column 2) reveals a significant negative interaction between kinship intensity and intentionality on the severity of moral judgments (ß = –0.30 [95%CIs –0.39, –0.22], $p < 0.001$). This coefficient represents the change in slope between the KII and our Severity of Moral Judgment Index when comparing low-intent scenarios to high-intent scenarios. For low-intent scenarios, moving one standard deviation on the Kinship Intensity Index scale is associated with about one-third of a standard deviation increase in the Severity of Moral Judgment Index (ß = 0.30 [95%CIs –0.045, 0.64], $p = 0.080$, Table S5 Column 2). In contrast, for high-intent scenarios, there is essentially no change in the severity of moral judgment across kinship intensities (ß = –0.00056 [95%CIs –0.35, 0.34], $p = 1.0$).

S7.2 Controlling for ecological risk

Including measures of ecological risk as covariates does not alter the central findings of this paper. We interacted the Ecological Risk Index (a measure of combined risk of droughts, earthquakes, floods, & cyclones, Table S5, Column 3) and mean annual temperature range (a measure of seasonality, Table S5, Column 4) with both Kinship Intensity Index and intention condition. Across all (pooled) vignette scenarios, the significant, negative interaction between Kinship Intensity Index and intention condition is robust to the inclusion of either ecological risk measure. There was no significant interaction between intention condition and Ecological Risk Index (ß = 0.069, [95% CIs –0.048, 0.19], $p = 0.25$) or mean annual temperature range (ß = 0.10, [95% CIs –0.070, 0.27], $p = 0.23$). This indicates that ecological risk does *not* explain the cross-cultural variation in the use of mental states during moral judgment.

When looking at each vignette scenario individually, the results are generally quite robust to the inclusion of ecological risk measures. When Ecological Risk Index is included in the model, the significant, negative interaction between Kinship Intensity Index and intention condition holds steady for theft (ß = –0.56, [95% CIs (–0.77, –0.36], $p < 0.001$, Table S6, Column 2) and physical harm (ß = –0.33, [95% CIs –0.53, –0.12], $p = 0.002$, Table S6, Column 4). Although the coefficient trends in the right direction for poisoning vignettes, the 95% confidence intervals include zero, just barely (ß = –0.15, [95% CIs –0.33, 0.027], $p = 0.10$; Table S6, Column 6; Figure S6, Panel B). However, when Mean Annual Temperature Index is included in the model, the interaction between Kinship Intensity Index and intention condition remains significant for all three vignette scenarios: theft (ß = –0.46, [95% CIs –0.65, –0.28], $p < 0.001$, Table S7, Column 2), physical harm (ß = –0.25, [95% CIs –0.43, –0.060], $p = 0.009$, Table S7, Column 4), and poisoning (ß = –0.28, [95% CIs –0.43, –0.12], $p < 0.001$, Table S7, Column 6). The minimal impact of ecological risk variables on the interaction between kinship intensity and intention condition is visualized in Figure S6. In addition, as shown in Tables S6 & S7, there is no significant interaction between ecological risk variables and intention condition on Severity of Moral Judgment Index for any of the vignette scenarios. Once again, this provides no support for the Risk-Intentionality Hypothesis.

Table S5. Kinship Intensity, Intentionality, & Severity of Moral Judgment (Pooling All Vignettes)

	Severity of Judgment Index			
	(1)	(2)	(3)	(4)
Contemporary KII	0.30 (-0.032, 0.64)	0.30 (-0.045, 0.64)	0.26 (-0.23, 0.74)	0.29 (-0.088, 0.66)
High Intent	0.66*** (0.57, 0.76)	0.66*** (0.57, 0.75)	0.63*** (0.51, 0.75)	0.62*** (0.50, 0.74)
KII x High Intent	-0.31*** (-0.39, -0.22)	-0.30*** (-0.39, -0.22)	-0.28*** (-0.40, -0.17)	-0.26*** (-0.37, -0.16)
Age		0.033 (-0.020, 0.086)	0.034 (-0.019, 0.087)	0.035 (-0.018, 0.089)
Sex		-0.073 (-0.17, 0.027)	-0.074 (-0.17, 0.26)	-0.075 (-0.17, 0.025)
Ecological Risk Index			-0.15 (-0.62, 0.33)	
Risk x KII			0.13 (-0.48, 0.75)	
Risk x High Intent			0.069 (-0.048, 0.19)	
Risk x High Intent x KII			-0.051 (-0.19, 0.091)	
Annual Temperature Range				-0.0037 (-0.47, 0.47)
Temperature x KII				0.41 (-0.10, 0.93)
Temperature x High Intent				0.10 (-0.070, 0.27)
Temperature x High Intent x KII				-0.10 (-0.29, 0.082)
Random Effects				
Subject Standard Dev.	0.13	0.15	0.15	0.15
Society Standard Dev.	0.42	0.44	0.48	0.38
N	1279	1279	1279	1279
AIC	3290.4	3292.3	3307.0	3382.2
Log Likelihood	-1637.2	-1634.2	-1637.5	-1679.1

Notes: LMER estimates with 95% confidence intervals. Results pool across all 4 vignette scenarios (theft, physical harm, poisoning, & food taboo). The *Contemporary Kinship Intensity Index* combines measures of current kinship practices. *High Intent* indicates whether the vignette features a high intent harm (compared to a low intent harm). The Severity of Judgment Index combines measures of badness, punishment-worthiness, and reputation-damaging effects of harms. Individual-level covariates include age and sex. Measures of ecological risk include mean annual temperature range (a measure of seasonality) and the Ecological Risk Index, which combines risk of droughts, earthquakes, floods, and cyclones. All continuous variables have been standardized. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table S6. Kinship Intensity, Intentionality, & Severity of Moral Judgment – Controlling for Ecological Risk Index

	Severity of Judgment Index							
	Theft (1)	Theft (2)	Phys. Harm (3)	Phys. Harm (4)	Poisoning (5)	Poisoning (6)	Taboo (7)	Taboo (8)
Contemporary KII	0.37* (0.024, 0.72)	0.39 (-0.092, 0.87)	0.33 (-0.010, 0.68)	0.35 (-0.13, 0.84)	0.13 (-0.21, 0.47)	0.043 (-0.43, 0.52)	0.39* (0.040, 0.74)	0.27 (-0.22, 0.76)
High Intent	0.94*** (0.77, 1.1)	0.79*** (0.58, 1.0)	0.81*** (0.64, 0.97)	0.77*** (0.56, 0.99)	0.60*** (0.45, 0.74)	0.59*** (0.41, 0.77)	0.26** (0.077, 0.43)	0.28* (0.053, 0.52)
KII x High Intent	-0.53*** (-0.68, -0.38)	-0.56*** (-0.77, -0.36)	-0.30*** (-0.45, -0.15)	-0.33** (-0.53, -0.12)	-0.22*** (-0.35, -0.094)	-0.15 (-0.33, 0.027)	-0.11 (-0.26, 0.052)	-0.11 (-0.33, 0.12)
Age	0.028 (-0.023, 0.079)	0.026 (-0.026, 0.077)	0.028 (-0.023, 0.079)	0.026 (-0.026, 0.077)	0.028 (-0.023, 0.079)	0.026 (-0.026, 0.077)	0.028 (-0.023, 0.079)	0.026 (-0.026, 0.077)
Sex	-0.068 (-0.16, 0.029)	-0.065 (-0.16, 0.032)	-0.068 (-0.16, 0.029)	-0.065 (-0.16, 0.032)	-0.068 (-0.16, 0.029)	-0.065 (-0.16, 0.032)	-0.068 (-0.16, 0.029)	-0.065 (-0.16, 0.032)
Ecological Risk Index		-0.066 (-0.54, 0.41)		-0.085 (-0.56, 0.39)		-0.28 (-0.75, 0.18)		-0.17 (-0.64, 0.31)
Risk x KII		0.21 (-0.40, 0.83)		0.23 (-0.38, 0.84)		0.20 (-0.41, 0.81)		-0.095 (-0.72, 0.53)
Risk x High Intent		0.11 (-0.098, 0.32)		-0.023 (-0.23, 0.19)		0.16 (-0.021, 0.33)		-0.030 (-0.26, 0.20)
Risk x High Intent x KII		-0.26* (-0.52, -0.011)		-0.045 (-0.30, 0.21)		0.0036 (-0.21, 0.22)		0.059 (-0.21, 0.33)
Random Effects								
Subject Standard Dev.	0.26	0.26	0.26	0.26	0.26	0.26	0.26	0.26
Society Standard Dev.	0.42	0.45	0.42	0.45	0.42	0.45	0.42	0.45
N	321	321	320	320	321	321	317	317
AIC	2987.5	3027.0	2987.5	3027.0	2987.5	3027.0	2987.5	3027.0
Log Likelihood	-1457.7	-1461.5	-1457.7	-1461.5	-1457.7	-1461.5	-1457.7	-1461.5

Notes: LMER estimates with 95% confidence intervals. To produce these results, we ran a single model that interacted vignette scenario, Kinship Intensity Index, intention condition, and Ecological Risk Index on Severity of Moral Judgment Index. The full sample included in the model contains 1279 observations; the *N* listed in each column of this table gives the number of observations per vignette. Additional output variables have been omitted for simplicity; the R code for the full results is available upon request. The *Kinship Intensity Index* combines measures of current kinship practices. *High Intent* indicates whether the vignette features a high (vs. low) intent harm. The Severity of Judgment Index combines measures of badness, punishment-worthiness, and reputation-damaging effects of harms. Individual-level covariates include age and sex. The *Ecological Risk Index* combines risk of droughts, earthquakes, floods, and cyclones. All continuous variables have been standardized. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

Table S7. Kinship Intensity, Intentionality, & Severity of Moral Judgment – Controlling for Mean Annual Temperature Range (Seasonality)

	Severity of Judgment Index							
	Theft (1)	Theft (2)	Phys. Harm (3)	Phys. Harm (4)	Poisoning (5)	Poisoning (6)	Taboo (7)	Taboo (8)
Contemporary KII	0.37* (0.024, 0.72)	0.24 (-0.15, 0.62)	0.33 (-0.010, 0.68)	0.28 (-0.099, 0.66)	0.13 (-0.21, 0.47)	0.21 (-0.17, 0.58)	0.39* (0.040, 0.74)	0.47* (0.088, 0.87)
High Intent	0.94*** (0.77, 1.1)	0.89*** (0.67, 1.1)	0.81*** (0.64, 0.97)	0.75*** (0.52, 0.97)	0.60*** (0.45, 0.74)	0.43*** (0.24, 0.62)	0.25** (0.077, 0.43)	0.33** (0.089, 0.57)
KII x High Intent	-0.53*** (-0.68, -0.38)	-0.46*** (-0.65, -0.28)	-0.31*** (-0.47, -0.15)	-0.25** (-0.43, -0.060)	-0.22*** (-0.35, -0.094)	-0.28*** (-0.43, -0.12)	-0.11 (-0.26, 0.092)	-0.047 (-0.25, 0.15)
Age	0.028 (-0.023, 0.079)	0.032 (-0.020, 0.083)	0.028 (-0.023, 0.079)	0.032 (-0.020, 0.083)	0.028 (-0.023, 0.079)	0.032 (-0.020, 0.083)	0.028 (-0.023, 0.052)	0.032 (-0.020, 0.083)
Sex	-0.068 (-0.16, 0.029)	-0.072 (-0.17, 0.025)	-0.068 (-0.16, 0.029)	-0.072 (-0.17, 0.025)	-0.068 (-0.16, 0.029)	-0.072 (-0.17, 0.025)	-0.068 (-0.16, 0.029)	-0.072 (-0.17, 0.025)
Annual Temperature Range		-0.34 (-0.83, 0.16)		-0.10 (-0.61, 0.41)		0.22 (-0.28, 0.72)		0.28 (-0.24, 0.79)
Temperature x KII		0.14 (-0.40, 0.68)		0.30 (-0.25, 0.86)		0.77* (0.23, 1.3)		0.49 (-0.072, 1.1)
Temperature x High Intent		0.18 (-0.13, 0.48)		0.14 (-0.17, 0.44)		-0.12 (-0.38, 0.14)		0.16 (-0.18, 0.49)
Temperature x High Intent x KII		-0.11 (-0.44, 0.22)		-0.15 (-0.48, 0.18)		-0.39** (-0.67, -0.11)		0.16 (-0.20, 0.52)
Random Effects								
Subject Standard Dev.	0.26	0.27	0.26	0.27	0.26	0.27	0.26	0.27
Society Standard Dev.	0.42	0.36	0.42	0.36	0.42	0.36	0.42	0.36
N	321	321	320	320	321	321	317	317
AIC	2987.5	2990.5	2987.5	2990.5	2987.5	2990.5	2987.5	2990.5
Log Likelihood	-1457.7	-1443.3	-1457.7	-1443.3	-1457.7	-1443.3	-1457.7	-1443.3

Notes: LMER estimates with 95% confidence intervals. To produce these results, we ran a single model that interacted vignette scenario, Kinship Intensity Index, intention condition, and Annual Temperature Range on Severity of Moral Judgment Index. The full sample included in the model contains 1279 observations; the *N* listed in each column of this table gives the number of observations per vignette.Additional output variables have been omitted for simplicity; the R code for the full results is available upon request. The *Kinship Intensity Index* combines measures of current kinship practices. *High Intent* indicates whether the vignette features a high (vs. low) intent harm. The Severity of Judgment Index combines measures of badness, punishment-worthiness, and reputation-damaging effects of harms. Individual-level covariates include age and sex. *Mean Annual Temperature Range* is a measure of seasonality. All continuous variables have been standardized. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

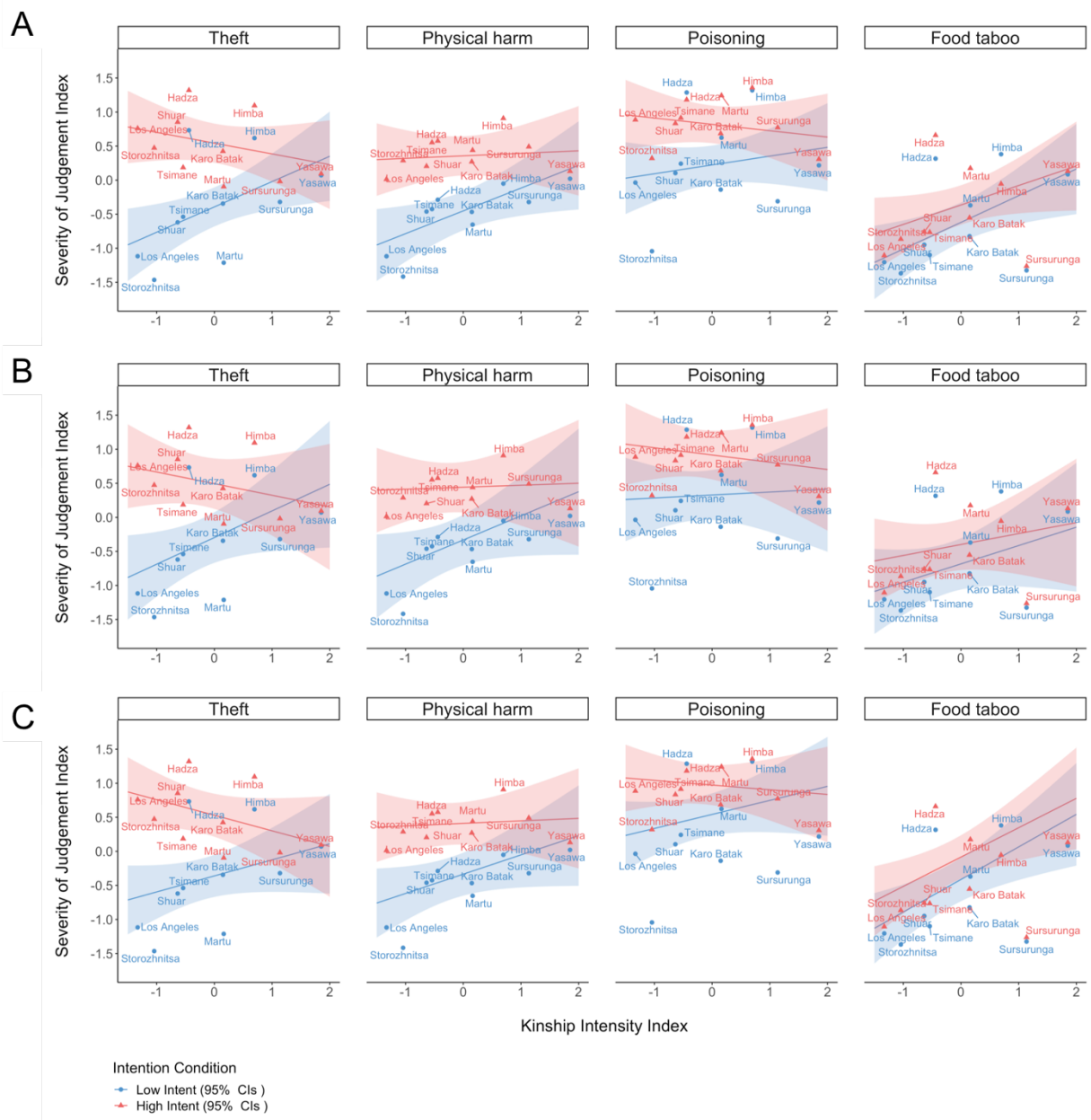

Figure S6. Reliance on intention in moral judgment decreases with kinship intensity across three vignette scenarios without (**A**) and with covariates for ecological risk: (**B**) Ecological Risk Index and **(C)** mean annual temperature range. The regression lines show fitted values and 95% confidence intervals produced by LMER predicting Severity of Judgment Index from the interaction between Kinship Intensity Index, intentionality condition, and ecological risk covariates in four vignette scenarios (theft, physical harm, poisoning, and food taboo violation). The Severity of Judgment Index combines measures of badness, punishment-worthiness, and reputation-damaging effects of harms. All models include random intercepts for subjects and societies and individual-level covariates (sex & age). Labeled points show the average Severity of Judgment in each society for high and low intent harms. **A**. Baseline model, controlling only for individual co-variates. **B.** Model includes Ecological Risk Index (risk of droughts, earthquakes, floods, and cyclones). For plotting, Ecological Risk Index was held at its mean. The coefficients on KII x Intention Condition remain significant for the theft & physical harm scenarios, but not for poisoning. **C.** Model includes Mean Annual Temperature Range (a measure of seasonality). For plotting, Temperature Range was held at its mean. The coefficients on KII x Intention Condition remain significant for the theft, physical harm, and poisoning scenarios.

S7.3 Using Ancestral Kinship Intensity Index as a predictor

Using the Ancestral Kinship Intensity Index in place of the Contemporary Kinship Intensity Index (referred to simply as the Kinship Intensity Index throughout the paper) does not impact the results. As before, there is a significant, negative relationship between kinship intensity and intentionality condition across all vignette scenarios (ß = –0.29 [95%CIs –0.38, –0.20, p < 0.001), as well as separately for theft (ß = –0.51 [95%CIs –0.67, –0.34, p < 0.001), physical harm (ß = –0.31 [95%CIs –0.47, –0.15, p < 0.001), and poisoning (ß = –0.23 [95%CIs –0.37, –0.086, p = 0.002) (Figure S7).

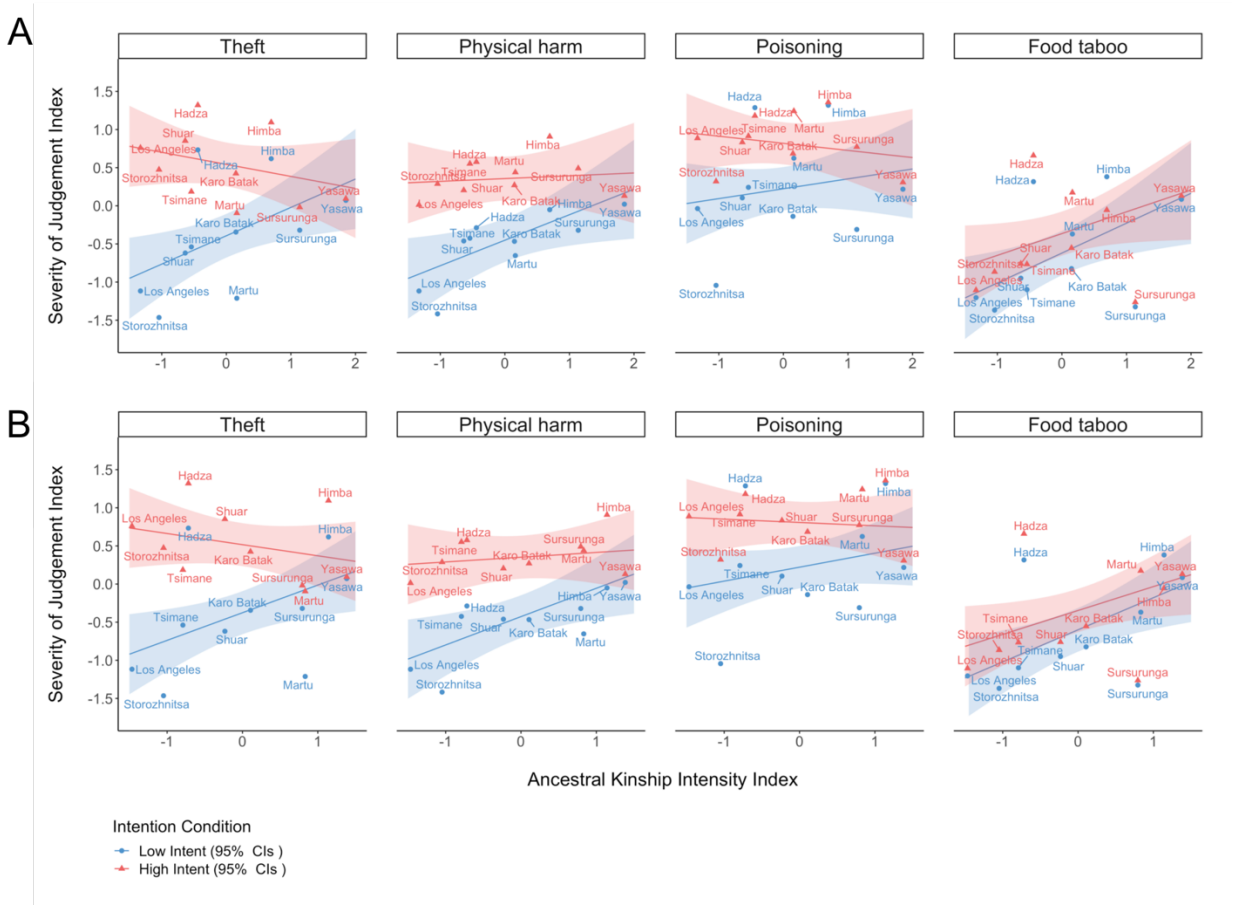

Figure S7. Reliance on intention in moral judgment decreases with (**A**) contemporary and (**B**) ancestral kinship intensity across three vignette scenarios. The regression lines show fitted values and 95% confidence intervals produced by Linear Mixed Effects Regression predicting Severity of Judgment Index from the interaction between (**A**) Contemporary or (**B**) Ancestral Kinship Intensity Index and intentionality condition in four vignette scenarios (theft, physical harm, poisoning, and food taboo violation). The Severity of Judgment Index combines measures of badness, punishment-worthiness, and reputation-damaging effects of harms. The models include random intercepts for subjects and societies and individual-level covariates (sex & age). Labeled points show the average Severity of Judgment in each society for high and low intent harms.

S7.4 Using judgments of badness, punishment, and reputation separately as outcome variables

As reported in the main text, there is a significant negative interaction between kinship intensity and intentionality on the Severity of Moral Judgment Index. This result also holds when considering each type moral judgment separately. Across all vignette scenarios, there is a significant negative interaction between Kinship Intensity Index and intentionality on judgments about badness (ß = –0.20 [95%CIs –0.28, –0.12, p < 0.001), punishment (ß = –0.19 [95%CIs –0.26, –0.11, p < 0.001), and reputation (ß = –0.32 [95%CIs –0.40, –0.24, p < 0.001) (Figure S8).

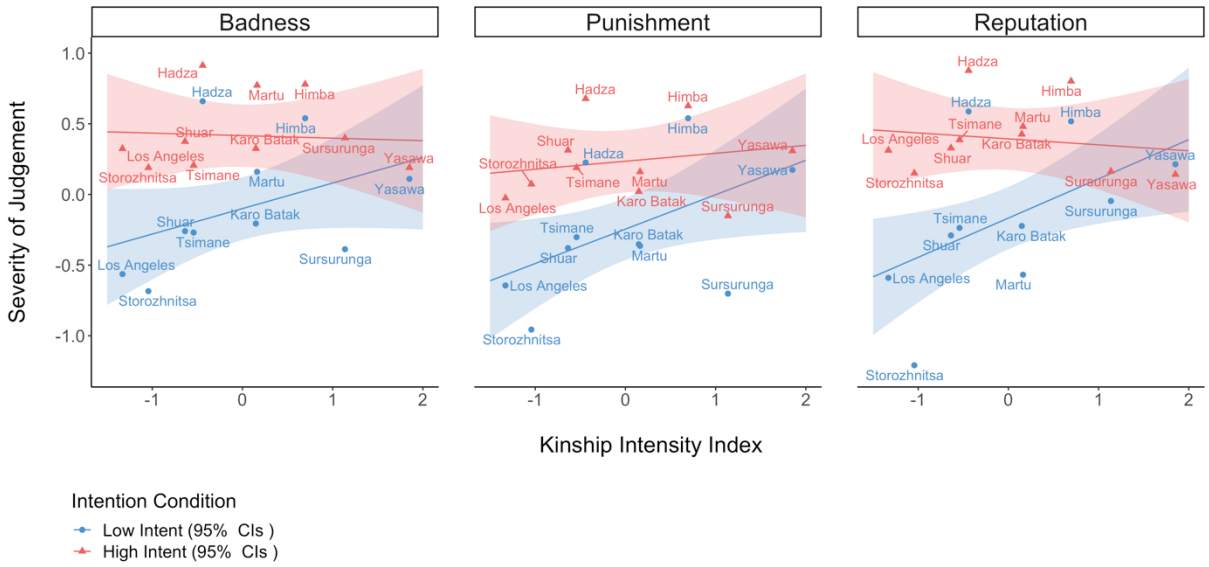

Figure S8. Reliance on intention when making judgments about badness, punishment-worthiness, and reputation-damaging effect of harms decreases with kinship intensity. The regression lines show fitted values and 95% confidence intervals produced by Linear Mixed Effects Regression predicting severity of judgment from the interaction between Kinship Intensity Index and intentionality condition across four vignette scenarios (theft, physical harm, poisoning, and food taboo violation). The model includes random intercepts for subjects and societies and individual-level covariates (sex & age). Labeled points show the average severity of judgment in each society for high and low intent harms.

S7.5 Mitigating Factors analysis

Our analysis of the mitigating factor data offers further support for the kinship intensity hypothesis. Figure S9 and Table S8 reveal a significant, negative interaction between KII and mitigating condition on the severity of moral judgment (ß = –0.28 [95%CIs –0.39, –0.17], $p <$ 0.001, Table S8, Column 2). Similar to the analysis above, this interaction represents the change in slope between KII and Severity of Moral Judgment Index when comparing vignettes without a mitigating factor to those with a mitigating factor. As shown in Figure S9, consideration of potentially mitigating factors during moral judgment declines as kinship intensity rises. This negative interaction holds up to the inclusion of both the Ecological Risk Index (ß = –0.33, [95% CIs –0.48, –0.18], $p < 0.001$) and mean annual temperature range (ß = –0.22, [95% CIs –0.35, –0.080], $p = 0.002$).

As shown in Table S8, neither Ecological Risk Index (Column 3) nor Mean Annual Temperature Range (Column 4) reveal a significant, negative interaction with mitigating condition on the severity of moral judgment. Therefore, this analysis provides no support for the Risk-Intentionality Hypothesis.

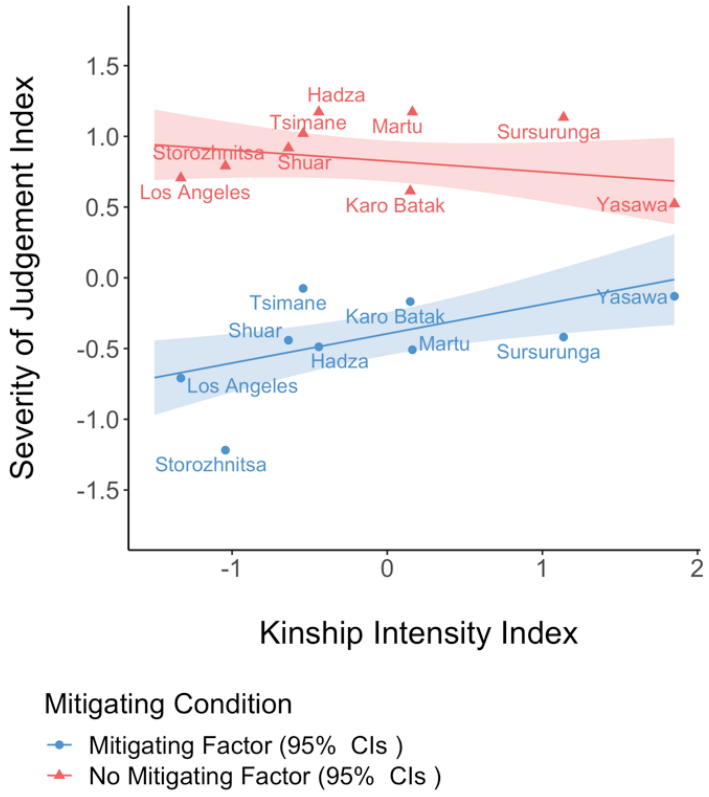

Figure S9. Effect of mitigating factors on severity of moral judgment declines with kinship intensity. The regression lines show fitted values and 95% confidence intervals produced by Linear Mixed Effects Regression predicting Severity of Moral Judgment from the interaction between Kinship Intensity Index and mitigating condition. The Severity of Judgment Index combines measures of badness, punishment-worthiness, and reputation-damaging effects of harms. The model includes random intercepts for subjects and societies and individual-level covariates (sex & age). All continuous variables have been standardized. Labeled points show the average severity of moral judgment in each society. (This figure appears in the Main Text at Figure 5.)

Table S8. Kinship Intensity, Mitigating Factors, and Severity of Moral Judgment

	Severity of Judgment Index			
	(1)	(2)	(3)	(4)
Contemporary KII	0.21* (0.027, 0.39)	0.021* (0.029, 0.38)	0.024* (0.055, 0.43)	0.14* (0.0047, 0.28)
Not Mitigated	1.3*** (1.1, 1.4)	1.22*** (1.1, 1.3)	1.18*** (1.0, 1.3)	1.2*** (1.0, 1.4)
KII x Not Mitigated	-0.27*** (-0.38, -0.16)	-0.28*** (-0.39, -0.17)	-0.33*** (-0.48, -0.18)	-0.22** (-0.35, -0.080)
Age		-0.26 (-0.098, 0.047)	-0.030 (-0.10, 0.042)	-0.013 (-0.085, 0.058)
Sex		-0.18* (-0.32, -0.033))	-0.17* (-0.31, -0.022)	-0.19* (-0.33, -0.039)
Ecological Risk Index			-0.038 (-0.22, 0.15)	
Risk x KII			0.21 (-0.018, 0.44)	
Risk x Not Mitigated			-0.047 (-0.20, 0.10)	
Risk x Not Mitigated x KII			-0.081 (-0.26, 0.10)	
Annual Temperature Range				-0.14 (-0.36, 0.086)
Temperature x KII				0.20 (-0.038, 0.45)
Temperature x Not Mitigated				0.20 (-0.013, 0.42)
Temperature x Not Mitigated x KII				-0.030 (-0.26, 0.20)
Random Effects				
Subject Standard Dev.	0.23	0.18	0.19	0.18
Society Standard Dev.	0.17	0.17	0.093	0.0003
N	440	440	440	440
AIC	1016.8	1015.6	1029.5	1018.5
Log Likelihood	-500.4	-495.8	-498.8	-493.3

Notes: LMER estimates with 95% confidence intervals. The *Contemporary Kinship Intensity Index* combines measures of current kinship practices. *Not Mitigated* indicates whether the vignette features battery with no mitigating factor, versus battery with a mitigating factor (self-defense or necessity). Individual-level covariates include age and sex. Measures of ecological risk include mean annual temperature range (a measure of seasonality) and the Ecological Risk Index, which combines risk of droughts, earthquakes, floods, and cyclones. All continuous variables have been standardized. *** $p < 0.001$, ** $p < 0.01$, * $p < 0.05$

S7.6 Urbanization robustness check

Excluding the one urban site (Los Angeles) from the sample has little impact on the results. Pooling across all vignette scenarios, the coefficient on the interaction between Kinship Intensity Index and intention condition barely changes, remaining negative and significant (ß = –0.30 [95%CIs –0.40, -0.21], $p < 0.001$). Similarly, when looking at each scenario individually, the results are robust to dropping Los Angeles from the sample (Figure S10). The significant, negative interaction between Kinship Intensity Index and intention condition on severity of moral judgment changes little for theft (ß = –0.49 [95%CIs –0.66, –0.32], $p < 0.001$), physical harm (ß = –0.31 [95%CIs –0.48, –0.15], $p < 0.001$), or poisoning (ß = –0.21 [95%CIs –0.35, –0.06], $p = 0.005$).

The re-analysis of the Mitigating Factors vignettes yields similar results. Excluding Los Angeles from the sample, we still find a significant, negative interaction between KII and mitigating condition on severity of moral judgment (ß = –0.31 [95%CIs –0.43, –0.18], $p < 0.001$).

Together, these results suggest that rural-urban differences cannot explain the differences in reliance on mental states during moral judgment in the Barrett et al. (2016) cross-cultural sample.

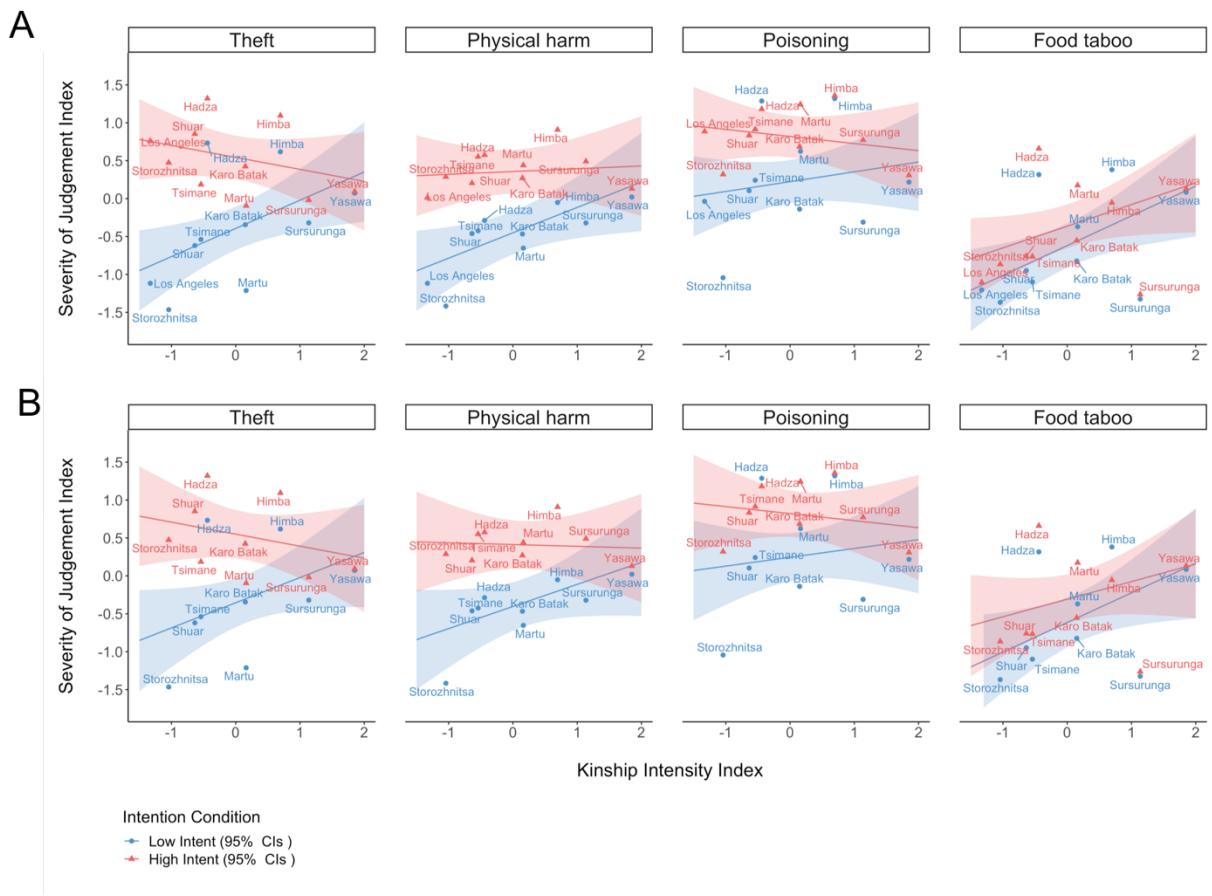

Figure S10. Reliance on intention in moral judgment decreases with kinship intensity across three vignette scenarios when using the full sample of 10 societies (**A**) and when using only the 9 rural societies (**B**). The regression lines show fitted values and 95% confidence intervals produced by LMER predicting Severity of Judgment Index from the interaction between Kinship Intensity Index and intent condition in four vignette scenarios (theft, physical harm, poisoning, and food taboo violation). The Severity of Judgment Index combines measures of badness, punishment-worthiness, and reputation-damaging effects of harms. All models include random intercepts for subjects and societies and individual-level covariates (sex & age). Labeled points show the average Severity of Judgment in each society for high and low intent harms. **A**. The full sample of 10 societies. **B.** The reduced sample of 9 rural societies (excluding Los Angeles).

Part III. Background on theory of mind in humans

Considering the intentions of others in the context of moral judgment requires theory of mind. Two major theories propose that high-level theory of mind is a human cognitive adaptation for life in highly social groups. The "social brain" or "Machiavellian intelligence" hypothesis suggests that theory of mind is one feature in a suite of socio-cognitive abilities selected for because it helped individuals manage competitive relationships and out-maneuver competitors in large social groups (Byrne & Corp, 2004; Dunbar, 2009; Dunbar & Shultz, 2007). By contrast, the "cultural brain" or "cumulative cultural brain" hypotheses suggest that theory of mind is one of several specialized socio-cognitive skills that enhanced cultural and social learning ability, providing a selective advantage in the acquisition of adaptive cultural traits (Herrmann, Call, Hernández-Lloreda, Hare, & Tomasello, 2007; Muthukrishna, Doebeli, Chudek, & Henrich, 2018; Muthukrishna & Henrich, 2016).

Several lines of evidence support the claim that advanced theory of mind is an evolved feature of human cognition. Although mounting evidence suggests that non-human primates have more advanced theory of mind capabilities than once believed (Kano, Krupenye, Hirata, Tomonaga, & Call, 2019; Krupenye & Call, 2019; Krupenye, Kano, Hirata, Call, & Tomasello, 2016), humans possess particularly advanced mentalizing abilities. For example, comparing the cognitive abilities of human toddlers and adult chimpanzees, Herrmann et al. (2007) found that chimps matched toddlers in many cognitive tasks, but were far outstripped in the realm of social cognition, including in their theory of mind abilities.

Consistent with the centrality of mentalizing in humans, research in cognitive development has demonstrated that the ability of subjects to recognize others' false beliefs ("false-belief understanding") develops remarkably early. Using spontaneous-response tasks, researchers have repeatedly shown that even pre-verbal infants can understand false beliefs (for a review, see Baillargeon, Scott, & Bian, 2016). Evidence from diverse populations confirms that this ability emerges before age 4, providing further evidence that it may be part of our species' evolved psychology (Barrett et al., 2013).

Together, this research suggests that humans everywhere are typically capable of using theory of mind and, relatedly, attending to intentions and mental states while making moral judgments. Nevertheless, just as our evolved anatomical specializations for fast, accurate throwing may or may not be included in every group's repertoire of hunting skills, mentalizing may or may not be integrated into every psychological phenotype. It is already clear that, even at the level of brain activation (Chakroff et al., 2016), cognitively mature humans are not obligated to deploy mentalizing when judging the moral responsibility of others.

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