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A Cognitive Perspective on Cultural Evolution: Exploring Cultural Dynamics from Individual So- cial Learning

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Date: 2020-08-14T00:00:00+00:00

Abstract

Cultural evolution is a research topic in cultural studies that draws concern from multiple disciplines. The cognitive perspective on cultural evolution represents an approach for psychologists to engage with this topic; it focuses on individual cognition within sociocultural environments, examining how individuals process, modify, store, and retrieve cultural information during social learning. This cognitive perspective draws upon Darwin's theory of biological evolution, encompassing three subdomains—cultural inheritance, innovation, and selection—and proposes three principles of cultural evolution: inheritance, variation, and selection. Pathways of cultural transmission include imitation and teaching, with types divided into instrumental and customary cultural transmission. Cultural innovation exhibits hierarchical properties; uniquely human cumulative cultural evolution is founded upon cultural innovation, manifesting the intergenerational transmission of such innovation. Cultural selection, grounded in behavioral ecology and human cognitive mechanisms, results in the differential adaptation of cultural information. Future research can advance cognitive perspectives on cultural evolution through three dimensions: research concepts, frameworks, and methods—by exploring higher-level cultural innovation, expanding antecedent variables of cultural evolution, and integrating new technologies to deepen understanding of cultural evolution; and by harnessing the facilitating role of cultural evolution in cultural psychology research to investigate how cultural mixing and individual psychological characteristics influence cultural evolution.

Full Text

The Cognitive Perspective on Cultural Evolution: Exploring Cultural Dynamics Through Individual Social Learning

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Abstract: Cultural evolution is a multidisciplinary research topic of shared interest across the social and biological sciences. The cognitive perspective represents a distinctive psychological approach to this domain, focusing on individual cognition within sociocultural environments and examining how cultural information is processed, modified, stored, and retrieved during social learning. Drawing on Darwin's theory of biological evolution, this perspective encompasses three interconnected subdomains—cultural inheritance, innovation, and selection—and proposes three principles of cultural evolution: inheritance, variation, and selection. Cultural inheritance operates through pathways of imitation and teaching, and can be categorized into instrumental and conventional forms. Cultural innovation is hierarchical in nature, with human-unique cumulative cultural evolution built upon such innovation and reflecting its intergenerational transmission. Cultural selection, grounded in behavioral ecology and human cognitive mechanisms, produces differential adaptation of cultural information. Future research should explore higher-level cultural innovation, expand the antecedent variables of cultural evolution, and leverage new technologies to deepen understanding of cultural evolution. Additionally, cultural evolution research can advance cultural psychology by investigating cultural mixing and the influence of personality traits on cultural evolution.

Keywords: cultural evolution; social learning; cultural inheritance; cultural innovation; cultural selection

“What are the roots of human culture?” This question, listed among the 125 frontier scientific questions identified by *Science* in 2005 (Kennedy & Norman, 2005), encapsulates the core concerns of cultural evolution research: the origins, transformations, and mechanisms of cultural change. Cultural evolution studies adopt Darwin's theory of biological evolution as a framework for understanding cultural change (Mesoudi, 2017). In this field, “culture” is operationalized as all information that influences individual behavior, including beliefs, knowledge, tools, technologies, attitudes, norms, languages, and more (Mesoudi, 2017). Individuals acquire such information through teaching, imitation, and other forms of social (non-genetic) transmission.

The concept of cultural evolution draws directly from biological evolution. For biological evolution, three conditions must be met: correlation between parent

and offspring entities in traits that contribute to differential adaptation; variation in traits among entities within a population; and differential survival and reproduction rates among entities. These correspond to the principles of inheritance, variation, and selection in biological evolution. Mesoudi (2016) transposed these three principles to the cultural domain, arguing that cultural evolution follows analogous principles: cultural information is transmitted between individuals through social learning mechanisms (inheritance principle); cultural information exhibits variation during transmission (variation principle); and cultural information has differential preservation and reproduction rates (selection principle).

Cultural evolution is an interdisciplinary field encompassing cultural anthropology, biology, computer science, psychology, and other disciplines. Cultural anthropologists study culture as their primary object, with cultural formation and transformation inherent to their discipline, though their research often remains descriptive and based on fieldwork. Biologists construct ecological models of cultural evolution grounded in evolutionary theory. Computer scientists provide new technologies and methods, such as computational simulations, for cultural evolution research.

The cognitive perspective on cultural evolution offers psychologists a unique entry point into this domain. This perspective positions social learning as central to understanding cultural evolution (Kline et al., 2018). Social learning refers to learning influenced by others, whether through observing others' behaviors or through direct interaction (Heyes, 1994). Unlike other approaches that focus primarily on culture as an object and its long-term changes, the cognitive perspective begins with "people" as the subjects of culture. It examines individual cognition within sociocultural environments, investigating how cultural information is processed, modified, stored, and retrieved during social learning. This approach constitutes a micro-level investigation of the macro-level question of cultural evolution, addressing how cultural dynamics can be explored from the individual level. Research on cultural evolution from a social learning perspective primarily focuses on three interrelated questions: the similarities in cultural information during social learning (cultural inheritance), the differences (cultural innovation), and which cultures better adapt to the environment and are thus preserved through selection (cultural selection). This article reviews and synthesizes these three domains and their corresponding principles of cultural evolution, introduces relevant research hotspots and trends, and proposes directions for future development.

2. Cultural Inheritance

From the cognitive perspective, cultural inheritance can be understood as individuals learning existing knowledge through social learning processes. This corresponds to the inheritance principle of cultural evolution. Cultural inheritance can be categorized by participant roles into imitation (learner-centered) and teaching (educator-centered), and by content into instrumental cultural

inheritance and conventional cultural inheritance.

2.1.1 Imitation

Imitation is a fundamental human capacity, with evidence suggesting its emergence in early infancy (Heyes, 2018). When children observe adults demonstrating goal-directed actions, they show a strong tendency to imitate all demonstrated behaviors, even those that appear superfluous. For example, when adults demonstrate using a stick to manipulate a switch to open and close a box, children repeatedly imitate the switch-manipulation action even after discovering they can operate the box more easily with their hands directly (Nielsen et al., 2012). This phenomenon is termed overimitation, and the superfluous information contained in such actions is called redundant information.

Redundant information arises both from mechanical repetition and from multi-level processing and multi-angle learning of information. Both approaches facilitate cultural inheritance, though the latter proves more effective. Acerbi and Tennie (2016) employed agent-based computer modeling, manipulating four variables: action sequence length (number of steps required to complete a virtual task), action difficulty, number of learning trials (mechanical learning), and information hierarchy (multi-level, multi-angle learning). Simulation results revealed that learning effectiveness declined significantly as action sequence length increased. However, adjusting action difficulty, learning trials, and information hierarchy effectively slowed this decline. Among these approaches, multi-level information processing yielded significantly higher success rates in action completion compared to other methods, demonstrating superior information transmission effectiveness.

2.1.2 Teaching

Teaching represents another form of cultural inheritance, centered on educators. Teaching practices vary significantly across cultural contexts. For instance, American parents tend to use verbal instruction more frequently, whereas parents in Vanuatu (a Pacific island nation) rely more on non-verbal methods such as gestures (Legare, 2017). Even when focusing specifically on verbal instruction, cross-cultural differences emerge: North American fathers tend to slow their speech when instructing infants, while Vanuatu fathers prefer to adjust their vocal pitch (Broesch & Bryant, 2018). Additionally, compared to modern societies, parents in labor-intensive agricultural societies teach children basic survival skills (such as planting, harvesting, and cooking) at earlier ages (Lancy, 2014).

How does teaching influence cultural inheritance in multicultural societies amid increasing globalization? Mesoudi et al. (2016) investigated cultural values among British Bangladeshis (first- and second-generation immigrants) and white British individuals. They found that for collectivist values, both first- and second-generation immigrants scored significantly higher than

white British participants, with first-generation immigrants scoring higher than second-generation immigrants. For individualist values, no significant differences emerged among the three groups. The researchers also measured background information including gender, occupation, family contact, and media usage. Regression models revealed different predictors for the two value orientations: media usage significantly predicted individualism levels, while family contact significantly predicted collectivism levels. Family contact involves family interactions and family education. These findings indicate that while British Bangladeshi immigrants' individualism levels matched those of white British individuals, second-generation immigrants' collectivism levels decreased significantly compared to first-generation immigrants, demonstrating the impact of multicultural contexts on teaching effectiveness. Nevertheless, their collectivism levels remained significantly higher than those of white British individuals, with family contact emerging as a significant predictor of collectivism. Thus, teaching continues to play a vital role in transmitting cultural values within multicultural societies.

2.2 Types of Cultural Inheritance

Cultural inheritance can be divided into two types based on content: instrumental culture (such as technology) and conventional culture (such as rituals).

2.2.1 The Nature and Laboratory Manipulation of Instrumental and Conventional Culture Instrumental culture refers to cultural information with clear physical-causal logic, which contrasts with social stipulation and emphasizes inherent causal relationships between things. For example, the physical laws governing changes in matter states reflect such logic, and weather modification technologies based on these laws constitute instrumental culture. Instrumental culture has two characteristics: clear causal logic and emphasis on outcomes or goals. Researchers manipulate instrumental culture in laboratories through two primary methods: first, presenting participants with action sequences where initial and final states differ, stimulating curiosity about the sequence's logic and framing it as instrumental culture; second, providing linguistic cues such as "this is done in order to..." to activate participants' perception of instrumental culture (Clegg & Legare, 2017).

Conventional culture refers to cultural information based on social conventions – "established practices." Conventional culture lacks clear physical-causal logic, such as rain-praying rituals during droughts. Its defining characteristic is conventionality. Researchers manipulate conventional culture in laboratories by: first, presenting action sequences where initial and final states are identical, implying unclear logic and framing the sequence as conventional culture; second, providing linguistic cues such as "everyone does it this way" to activate participants' perception of conventional culture (Clegg & Legare, 2017).

2.2.2 Differences in Transmission Fidelity Across Cultural Types Research using these methods to distinguish children’s social learning of instrumental versus conventional culture reveals significant differences in transmission fidelity. Conventional information shows significantly higher fidelity than instrumental information (Legare et al., 2015). Furthermore, when parents have opportunities to assist children in social learning tasks, they provide more help when children learn conventional information (Clegg & Legare, 2017), indicating that both children and adults prioritize accurate transmission of conventional culture.

A cross-cultural study comparing American and Vanuatu children learning these two information types found that, regarding cultural type, children in both cultures exhibited higher fidelity when learning conventional compared to instrumental information, demonstrating a universal advantage for conventional culture transmission. Regarding nationality, while children from both cultures showed similarly high fidelity for conventional information (no significant difference), Vanuatu children demonstrated significantly higher fidelity for instrumental information than American children. Given that the United States represents individualistic culture and Vanuatu represents collectivistic culture, researchers concluded that cultural transmission accuracy is higher in collectivistic than individualistic cultural contexts (Clegg & Legare, 2016).

Researchers term this flexible adoption of different imitation strategies based on information type “imitative flexibility” (Legare et al., 2015). The emergence of imitative flexibility suggests that these two information types hold different psychological meanings for individuals. Instrumental information has relatively clear physical-causal logic; understanding it requires rational thinking, representing “cold” cognitive processing less influenced by emotion. Since achieving the final outcome matters more than matching the demonstration process, instrumental information tends to lose more details during transmission. In contrast, conventional information lacks clear physical-causal logic, and its “established practice” nature often carries social pressure. Failure to conform risks social exclusion, so understanding such information typically involves emotional thinking, representing “hot” cognitive processing more susceptible to emotional influence. Rituals within conventional information serve to unite people (邹小燕等, 2018), coordinate interpersonal actions, promote group cooperation (Cosmides & Tooby, 2013), and identify in-group versus out-group members. In-group members typically share unique rituals that represent their value identification with the group (McElreath et al., 2003). Research also shows that activating individuals’ sense of social ostracism significantly increases their imitation of conventional information (Watson-Jones et al., 2016), suggesting that the high fidelity of conventional information transmission may be motivated by individuals’ need to satisfy belongingness needs.

3. Cultural Innovation

While cultural inheritance is crucial, culture would stagnate without innovation. Cultural evolution encompasses not only inheriting existing culture but also innovating and changing based on it. Due to temporal changes, environmental shifts, and limitations of human cognition, some aspects of culture adapt to social development while others may hinder it. When culture becomes maladaptive, it drives innovation.

From the cognitive perspective, cultural innovation can be understood as individuals exploring new knowledge during social learning processes, corresponding to the variation principle of cultural evolution. Based on practical value, cultural innovation can be categorized into low-level and high-level types. Additionally, cumulative cultural evolution—a uniquely human phenomenon and emerging hotspot in cultural evolution research—is built upon cultural innovation.

3.1 Levels of Cultural Innovation

Cultural innovation is hierarchical. The lowest level involves mere difference from existing culture. In laboratory studies of cultural evolution, “errors” children make when imitating action sequences are operationalized as “innovation” (Legare et al., 2015). Such “innovation” may seem meaningless but provides the foundation for higher-level innovation. Scott-Phillips (2017) briefly presented participants with 2-second images and asked them to reproduce the images on paper. One group saw lines that faintly formed an “ABC” pattern, while another saw the same number and shape of lines arranged randomly. The first group showed significantly better reproduction performance, demonstrating that the latter group engaged in more reconstruction or innovation, producing more structured patterns. This illustrates both how experience (recognizing ABC) influences innovation and how poorly structured information (random line combinations) offers greater innovation potential. Furthermore, given conventional information’s high fidelity, instrumental information provides greater innovation space. In this sense, innovation and imitation exist in an inverse relationship.

Higher-level innovation is purposeful, such as solving a new problem or improving existing solutions (Fabry, 2017). Meaningful innovation is challenging. In stone tool evolution, the transition from single-faced stones to double-faced axes took humans one million years (Stout & Hecht, 2017). Cultural product analysis can track cultural innovation (丰怡等, 2013). For example, researchers collected European cookbooks from medieval to modern times, coded the texts, and conducted statistical analyses. They found that over time, recipes showed significant increases in processing steps, methods, and ingredient quantities, indicating increasingly refined culinary techniques and more complex preparation methods (Lindenfors et al., 2015), demonstrating the continuity of European culinary cultural innovation.

3.2 Intergenerational Transmission of Cultural Innovation: Cumulative Cultural Evolution

Cumulative culture refers to culture built up across generations. Cumulative cultural evolution is the process of gradual behavioral improvement resulting from progressive modifications during social transmission of cultural behaviors (Caldwell et al., 2018). The ability to accumulate knowledge and experience across generations makes cultural accumulation possible and greatly expands the depth and breadth of human learning and teaching. The continuous modification and improvement of cultural behaviors demonstrate the crucial role of cumulative cultural evolution in transmitting human cognitive innovations across generations (Fabry, 2017). Carriers of cumulative cultural evolution include writing, images, audio, and other media. Comparative psychology shows that animals also possess social learning abilities, but lacking carriers for cultural accumulation, their social learning is limited to single generations. Thus, cumulative cultural evolution is uniquely human and has become a research hotspot (Dean et al., 2014).

Studying cumulative cultural evolution from a social learning perspective involves laboratory micro-simulations of this process, typically using transmission chain paradigms (Mesoudi, 2007; 辛自强, 刘国芳, 2012). Multiple participants form a transmission chain, passing information sequentially, with each participant representing a “generation,” thereby simulating cultural intergenerational transmission.

In typical experiments, participants complete manual tasks to simulate material cultural evolution. Compared to conditions where observing others is prohibited, allowing participants to observe others’ processes or products facilitates better task performance (Wasielewski, 2014). For instance, Caldwell et al. (2016) asked participants to fold paper airplanes (measuring flight distance) and build towers from clay (measuring height). Ten transmission chains of ten participants each were created. Except for the first participant who worked alone, subsequent participants could view the previous person’s manual work to inform their own approach. Results showed that participants at the end of chains performed significantly better than those at the beginning (airplanes flew farther, towers were taller), because observing others’ operations provided abundant reference information.

Building on this, researchers modified the design to reduce information availability, preventing participants from viewing the specific production process and only showing them the final product and performance data. Cumulative cultural effects still emerged. Researchers concluded that for these tasks, performance depended on the physical structure of the artifacts, and observing the final state and data provided sufficient information, so omitting the specific production process did not hinder cultural accumulation.

Further research examined task difficulty’s role in material cultural evolution. Caldwell et al. (2018) asked participants to tie knots of varying complexity

under three conditions: viewing only the final product, viewing the product plus an instruction booklet, and viewing the product plus instruction booklet with access to a teacher. Results showed that when task difficulty increased, only the discussion-teaching group significantly outperformed the other two groups; when task difficulty was low, this advantage was not evident. This indicates that as task difficulty increases, interaction and discussion become more critical for cultural accumulation, with active discussion proving more beneficial than passive observation for cumulative cultural evolution.

Recent research has also explored cumulative cultural evolution of social culture. In laboratory settings, participants complete social information transmission tasks to simulate this process. Fay et al. (2018) created a route-direction task with pairs of participants, each having a map with identical landmarks but only the information provider's map showing the route. The provider described the route while the receiver drew it on their map. Fifty-one transmission chains of eight participants each were created, with each participant serving as both receiver and provider for the next participant. Each pair worked on different pre-designed routes of equal difficulty. The study measured the accuracy of drawn routes and recorded participants' direction-giving statements. Two conditions were established: 26 chains in an observational learning group (receivers passively received information) and 25 chains in a discussion learning group (receivers and providers could interact). Results showed that from an intergenerational perspective, participants at chain ends showed significantly improved accuracy compared to those at chain beginnings in both conditions, demonstrating cumulative cultural effects. Researchers attributed this to the gradual accumulation of vocabulary that improved direction-giving accuracy and the disappearance of detrimental vocabulary. From a conditional perspective, the discussion learning group showed significantly higher accuracy than the observational learning group, confirming that discussion and interaction more strongly promote cultural accumulation. During cultural accumulation, participants became increasingly proficient and accurate in route-description language, while discussion and interaction clarified misunderstandings in transmission, making information transfer more efficient.

4. Cultural Selection

Both cultural inheritance and innovation occur under specific spatiotemporal conditions and are inevitably constrained by external environments. These external environments include not only ecological factors but also characteristics of human cognitive mechanisms.

From the cognitive perspective, cultural selection can be understood as differences in cultural information's preservation and reproduction rates resulting from individuals' tendencies during social learning, corresponding to the selection principle of cultural evolution. Higher preservation and reproduction rates indicate stronger cultural adaptability, broader influence within populations, and greater cultural "vitality." Cultural evolution is thus a process of continuous

adaptation to spatiotemporal environments and human cognitive mechanisms.

4.1 Behavioral Ecology-Based Cultural Selection

Behavioral ecology examines how environmental factors (population density, competitiveness, resource scarcity, pathogen prevalence, etc.) influence human and animal behavior (Varnum & Grossmann, 2017). For cultural evolution, population size is a crucial factor affecting cultural “vitality” —larger populations increase the probability of cultural innovation (Leite, 2016). Specifically, researchers have studied how population size and time affect communication system evolution. Participants completed a Pictionary task, creating drawings to represent concepts like “theater” and “museum,” which were then used for communication. Communication groups were divided into “2-person” and “8-person” groups. The earliest drawings were categorized as “early-stage” and the latest as “late-stage” materials. For communication systems, learnability (users’ ability to understand meanings) and usability (faithful reproduction of symbols) are crucial dimensions. Subsequent experiments treated population size as a within-subjects variable and time as a between-subjects variable, with learnability and usability as dependent variables. Results showed that recognition rates were significantly higher for early-stage than late-stage drawings, while reproduction rates were significantly higher for late-stage than early-stage drawings. This indicates that human communication systems evolve toward greater usability (simpler, easier to reproduce) but become less learnable (more abstract, harder to understand)—a phenomenon termed “usability trumps learnability.” Moreover, compared to 2-person groups, 8-person groups showed attenuated learnability loss and enhanced usability gains. Researchers explained that larger populations enable more iterations, facilitating simplification and usability, while increased iterations raise variation probability but also highlight effective information through competition, thereby enhancing learnability (Fay & Ellison, 2013). Other research has examined relationships between population size and tool richness/complexity in non-industrial food-producing societies, using archival data to confirm that larger populations possess more abundant and complex production tools, indicating higher levels of cultural evolution in material production (Collard et al., 2013).

However, recent research suggests that larger population sizes do not necessarily promote cultural evolution; only moderate populations facilitate cumulative cultural evolution (Fay et al., 2019). This study used the paper airplane folding paradigm with four conditions: individual learning (same person across generations, only self-referential information), 1-person/ generation social learning (each generation refers to previous generation’ s information, one person per generation), 2-person/generation social learning (each generation refers to previous generation’ s information, two people simultaneously but separately), and 4-person/generation social learning (each generation refers to previous generation’ s information, four people simultaneously but separately). Each condition had transmission chains of eight generations. Results showed that increased

population size significantly increased paper airplane flight distance, but only in generation 1. Comparing flight distance differences between generation 8 and generation 1, individual learning and 1-person/generation conditions showed significant increases, while 2-person and 4-person/generation conditions showed non-significant increases. Additionally, intergenerational similarity decreased as group size increased. Combined, these results indicate that excessively large group sizes weaken learning effectiveness and inhibit transmission fidelity, primarily because large groups create information overload, with participants seeing too many folding processes that exceed working memory capacity, thereby impairing cumulative cultural evolution (Fay et al., 2019).

Environmental competitiveness also influences cultural evolution. Intergroup competition can increase both the quantity and quality of information transmission within groups. Researchers had participants play a virtual net-weaving game via computer in groups of five. As the game progressed, participants accumulated net-weaving experience and engaged in virtual fishing, with fish quantity and weight directly affecting final scores. Participants could learn net-weaving techniques from group members, with two learning types: learning the “product” (final net appearance) and learning the “process” (production steps), with different costs (learning the process cost more, deducted from personal scores). Two conditions were established: intragroup competition (comparing individual scores) and intergroup competition (comparing group totals). Results showed that under intergroup competition, the “price” of learning others’ skills significantly decreased, leading to more learning behaviors, with learning the process exceeding learning the product. Under intragroup competition, learning the product exceeded learning the process. Thus, intergroup competition not only increased the quantity of information transmission within groups but also improved its quality (Derex et al., 2014).

4.2 Human Cognitive Mechanism-Based Cultural Selection

The environment of cultural evolution also includes human psychological needs, which directly affect cultural information transmission and diffusion. Some cultural information content possesses inherent transmission advantages, termed content bias. For instance, social and survival information spreads more easily, labeled “social information bias” (Mesoudi et al., 2006) and “survival information bias” (Nairne & Pandeirada, 2008), respectively. This occurs because humans are social beings sensitive to social information, and security is a basic need making survival information salient. Due to adaptive pressures, people tend to believe and transmit negative information more readily to maintain vigilance (Fessler et al., 2014). Researchers used transmission chain paradigms to study cultural information transmission, providing participants with urban legends of approximately 100 words each (social information: “online dating couple turns out to be father and daughter in real life” ; survival information: “spider crawls into woman’s hair and kills her” ; combined information: “boy attacked by gang” ; control: Wikipedia description of a canyon). Participants sequentially

transmitted the information. Results showed that information completeness decreased significantly with transmission 次数. Social and combined information showed significantly higher accuracy than survival information, which in turn exceeded the control group, confirming social and survival information biases, with social information bias being stronger (Stubbersfield et al., 2015). This may occur because social information better captures attention, while survival information in the study was psychologically distant from participants, reducing its effect.

Beyond content biases, cultural transmission also exhibits context bias—transmission influenced by factors beyond cultural content itself. Frequency-dependent bias, where information endorsed by the majority has transmission advantages (Nakahashi et al., 2012), represents a typical example. In one study, researchers defined cultural information as people’s descriptions of situations. Participants viewed multiple (2-6) zigzag lines on a computer and selected the longest. After choosing, they were shown “most people think line number... is longest” (representing majority-held cultural information). Notably, this line was programmed to differ from participants’ choices. Participants then decided whether to change their initial selection to conform to the majority. Changing indicated transmission of majority-endorsed cultural information. Participants were randomly assigned to three groups selecting among 2, 4, or 6 lines, with difficulty increasing accordingly. Results showed approximately 10% changed their initial choice in the 2-line condition, 25% in the 4-line condition, and 30% in the 6-line condition. This demonstrates that as task difficulty increases, participants become less certain of their choices, triggering conformity behavior and giving majority-endorsed cultural information greater transmission advantage (Muthukrishna et al., 2016).

Context bias also includes payoff bias or success bias. Because people desire success, the ideas and behaviors of successful individuals (wealthy, powerful, prestigious) are more readily imitated, even by children. One study presented children with two scenarios: one where bystanders watched an individual’s behavior, another where bystanders ignored it. Children only chose to imitate or prefer the behavior in the first scenario (Chudek et al., 2012), as bystander attention signaled higher social status while ignoring signaled lower status. Children used this cue to infer adaptive consequences and make decisions.

Molleman et al. (2014) summarized that in clearly structured decision situations (where better choices are definitively known), people are more influenced by payoff bias, making success-related information more transmissible. In ambiguous, dilemmatic situations, people are more influenced by frequency-dependent bias, making majority-endorsed information more transmissible.

5. Future Directions and Implications

5.1 Features and Advantages of Cognitive Perspective Research on Cultural Evolution

Cultural evolution is inherently a macro-level topic, characterizing cultural change over long timescales. It is also interdisciplinary, with different disciplines and perspectives offering distinct entry points. The cognitive perspective on cultural evolution represents psychology's unique contribution, possessing distinctive features and advantages compared to other approaches.

First, cognitive perspective research provides micro-level analytical units for cultural evolution by focusing on individuals in sociocultural environments and examining how cultural information is retained in human brains during social learning. Unlike macro-level studies in other fields that emphasize culture as an object, the cognitive perspective emphasizes people as subjects. By investigating the cognitive mechanisms underlying cultural evolution—namely, social learning mechanisms—this approach explores cultural evolution from the individual level, enabling micro-level examination of macro-level questions.

Second, cognitive perspective research transforms long-term cultural evolution into short-term processes, extracting the core cognitive elements of cultural evolution. Cumulative cultural evolution, for instance, inherently involves accumulation across generations, making experimental control impossible due to its timescale. The transmission chain paradigm simulates intergenerational cultural transmission while preserving the core of cumulative cultural evolution—the additive transmission of different individuals' experiences—compressing extensive cultural evolution into observable timeframes.

Third, cognitive perspective research better enables exploration of causal relationships between variables. Since most cognitive perspective research consists of laboratory studies, randomization of participants and active control of experimental conditions allow for causal conclusions. Other cultural evolution approaches either rely on material excavation and qualitative description (cultural anthropology) or ecological modeling and deduction (biology), which are not strict experimental studies and cannot address causal relationships.

Fourth, cognitive perspective research expands methodological approaches in cultural evolution, primarily through laboratory experimentation that enables the above advantages. Furthermore, findings from cognitive perspective research can be compared with those from other disciplines to test reliability, providing valuable contributions. In summary, behavioral experiments in laboratory settings represent psychology's methodological strength (辛自强, 刘国芳, 2012). Through experimental simulation of individual social learning processes, empirical investigation of cultural evolution's cognitive mechanisms accumulates data on cultural inheritance, innovation, and selection, empirically validating the scientific validity of the three principles (inheritance, variation, selection) underlying these domains.

5.2 Advancing Cognitive Perspective Research: Concepts, Approaches, and Methods

First, explore higher-level cultural innovation at the conceptual level. Much current social learning research focuses on low-level innovation, defining any difference from existing culture as innovation. This “blind innovation” is random and lacks systematicity. Higher-level “directed innovation” is systematic and purposeful, such as tool innovation (inventing new tools or using existing tools in novel ways). While blind innovation provides the knowledge and experience foundation for directed innovation (Legare & Nielsen, 2015), only directed innovation truly drives cumulative cultural evolution. Creativity represents the essence of human cognition, and research on higher-level innovation holds greater social value. Future studies could design experimental tasks requiring creativity to investigate the cognitive mechanisms and influencing factors of higher-level cultural innovation, such as tool innovation. Additionally, future research could propose and investigate the concept of disruptive cultural evolution. Borrowed from disruptive innovation theory in business management (Kumaraswamy et al., 2018), disruptive innovation does not involve incremental improvements to existing development paths but creates new markets through affordability and ease of use, transforming entire business environments. Similarly, we can conceive of disruptive cultural evolution: cultural evolution is not always gradual; sometimes dramatic changes occur, with key ideological concepts playing important roles. Concepts that are simple, understandable, and practical facilitate broad and deep dissemination (黄兴涛, 2019). Thus, in both business and culture, accessibility that aligns with human cognitive principles represents the key factor enabling “disruption.” Future research could construct concepts and theories of disruptive cultural evolution, exploring relevant cognitive mechanisms from the perspective of cultural information accessibility.

Second, expand antecedent variables of cultural evolution in research approaches. For example, investigate how social norms influence cultural evolution. From a cultural inheritance perspective, social norms constitute part of cultural information, specifically conventional culture. From a cultural selection perspective, behavioral ecology-based selection should consider not only natural ecology but also social ecology, of which social norms are a concrete manifestation. Tam (2015) found that when transmitting cultural information, people transmit not only internalized cultural information but also non-internalized information they may not endorse, according to social norms. Amato et al. (2018) used the Google Ngram database to study language evolution (Spanish and English), employing mathematical modeling to show that formal institutional, top-down enforced changes versus informal, bottom-up spontaneous changes produce different language evolution patterns: formal institutional influence creates more abrupt change paths, while informal influence creates more gradual paths. Schulz et al. (2019) addressed a psychological question (why Westerners and Westerners of European descent exhibit WEIRD characteristics and individualistic psychological traits) from anthropological (kinship systems) and

historical (medieval Eastern vs. Western European churches' different tolerance of cousin marriage) perspectives. They collected historical and contemporary data, showing that the medieval Western European church's strict prohibition of cousin marriage and promotion of monogamy weakened kinship system intensity, leading to the development of nuclear families and ultimately manifesting as WEIRD characteristics and individualistic psychological traits among Western European-descended white populations. Formal institutions resemble injunctive social norms, while informal institutions resemble descriptive norms—both can be activated in laboratory settings (陈维扬, 谢天, 2018). Social norm research suggests further distinguishing conventional culture into descriptive and injunctive types. Future studies could explore how descriptive and injunctive norms influence cultural evolution by activating corresponding norms and establishing cultural information transmission tasks to observe and summarize transmission characteristics under different normative contexts, thereby examining causal relationships between norm types and cultural evolution.

Additionally, research could examine state variables' effects on cultural evolution. Existing research has focused on various cognitive biases but neglected individuals' state variables. Nettle (2019) proposed that the same individual exhibits different cognitive tendencies and biases across different states. Using hunger as an example, he noted that hungry individuals are more likely to conform, increasing cultural information utilization. Future research could design experiments to test this and explore other state variables such as attention, anxiety, or even physical exertion. Attention to state variables helps explain individual variation in cultural evolution processes.

Third, integrate new technologies to deepen understanding of cultural evolution in research methods. For instance, cumulative cultural evolution research has primarily used single-chain transmission paradigms, whereas real life involves multi-directional influences within social networks. With computational social science development, social network analysis enables examination of multi-angle, multi-directional information transmission (郑路, 2017). Analyzing social network density can study cultural information diffusion speed. Additionally, technological development has expanded social learning platforms from face-to-face interaction to internet-based learning, broadening cultural evolution carriers from traditional print media, radio, and television to computers and smartphones, making cultural information transmission and acquisition increasingly convenient. How do these new carriers uniquely influence cultural evolution? Sparrow et al. (2011) found that widespread Google search engine use changed memory habits: remembering specific information became less important than remembering how to search for information online, with the internet becoming an important carrier of collective memory—a component of culture (shared social cognition). The internet's real-time updating characteristics may accelerate cultural evolution rates, a hypothesis future research could test.

Moreover, recent virtual reality technology development enables more immersive cultural information presentation (Slater & Sanchez-Vives, 2016). Using

this technology for cultural learning enhances presence, particularly for instrumental cultural information and operational skills, by creating more realistic learning environments that increase ecological validity of laboratory simulations. Future research could employ these new media and technologies to explore new characteristics and trends in cultural evolution.

Furthermore, big data methods are increasingly applied to cultural evolution research. Unlike laboratory experiments, big data methods collect naturally occurring real-life data with high authenticity, large volume, and substantial noise requiring theoretical guidance for screening (Qiu et al., 2018). In terms of data availability, Google has digitized millions of books in nine languages, providing a platform for analyzing massive text information. Researchers using Google Books Ngram have identified overall trends of decreasing collectivist values and increasing individualist values from 1800-2000 (Greenfield, 2013), with Chinese publications (1970-2008) showing similar results (Zeng & Greenfield, 2015; Hamamura & Xu, 2015). However, recent re-examination of Chinese publications from 1980-2008, using participant ratings (general public and experts) to classify search terms by perceived cultural importance (high, medium, low), found that while previous conclusions were replicated for medium and low importance terms, high cultural importance terms showed the opposite trend—increasing collectivist-related word frequency—demonstrating the explanatory power of cultural traditions (core cultural values) (Zhang & Weng, 2019). Future research could conduct more nuanced analyses, such as examining word frequency changes in different publication types from a social learning perspective, with textbooks as important learning carriers representing a focal research target. Beyond publications, big data from social media and mobile apps offer ecological validity advantages that complement higher internal validity laboratory data, enabling multi-angle, multi-level investigation of cultural evolution.

5.3 Leveraging Cultural Evolution to Advance Cultural Psychology Research

Cultural psychology views culture and psychology as intertwined, inseparable variables, exploring their mutual relationships (Heine, 2015). Cultural evolution's cognitive mechanisms, encompassing “culture” and “cognition,” are central to cultural psychology. Researchers have summarized different paradigms in cultural psychology as four waves of development (赵志裕等, 2015), with cultural evolution's cognitive mechanisms representing the newest wave that can propel cultural psychology forward.

Specifically, these four waves are: (1) cross-cultural psychology comparing across cultures; (2) indigenous psychology focusing on typological distinctions and deep description; (3) multicultural psychology emphasizing dynamic construction; and (4) polycultural psychology focusing on cultural interaction and dynamic change (Morris et al., 2015). The first two waves emphasize culture's static aspects, viewing culture as stable entities, examining psychological differences across cultures from an etic perspective or indigenous cultural influences from

an emic perspective. The latter two waves, emerging from accelerating globalization and cultural change, emphasize culture's dynamic aspects, viewing culture as a changing process. Dynamic construction introduced cultural priming experiments to cultural psychology, opening causal exploration of culture-psychology relationships. Multiculturalism respects cultural differences, advocating preservation of cultural characteristics, while polyculturalism emphasizes cultural interaction and change, viewing cultural characteristics as malleable and emphasizing experimental methods to further explore causal relationships. Cultural evolution research, focusing on cultural dynamic change, belongs to the fourth wave, explaining its rising prominence. Additionally, cultural psychology's focus on cultural dynamics is evident in Kashima et al. (2019) directly proposing the concept of "the psychology of cultural dynamics," identifying cultural evolution as an important approach. They divide cultural dynamics into three processes: generation of novel cultural information, social transmission of cultural information, and changes in cultural information popularity—corresponding directly to cultural innovation, inheritance, and selection discussed herein.

Regarding cultural psychology's fourth wave—polyculturalism—cultural mixing research examines how different cultural elements coexist in time and space (Chiu et al., 2011; 彭璐璐等, 2017). This emerging theme primarily studies cultural interaction and its effects horizontally. Cultural evolution psychology, conversely, combines evolutionary concepts and theories with psychological social learning theory and behavioral experimental methods to study cultural change vertically (俞国良, 谢天, 2014). Compared to early static, psychometric cross-cultural comparisons, cultural evolution and cultural mixing research together enrich empirical exploration of cultural dynamic processes and advance experimental methods in cultural psychology, opening broader avenues for causal investigation of culture-psychology relationships. Polyculturalism posits that cultural interaction has never ceased throughout history. Through frequent interaction, old cultures continuously evolve while new cultures emerge (赵志裕等, 2015). The relationship between cultural mixing and cultural evolution is an interesting and meaningful research topic; cultural mixing may itself be a driver of cultural evolution. For example, Zen Buddhism combines Indian Buddhism with original Chinese Daoist and Confucian thought, while Song-Ming Neo-Confucianism, especially its theories of mind and nature, aligned with the historical trend of three-teachings convergence. Cultural mixing research explores how different cultural combinations affect psychology but does not address how cultures actually mix, which cultures can mix to change original cultures or create new ones, or what happens when cultures of different influence meet. Future research could adapt transmission chain paradigms, providing story scenarios of cultural mixing for iterative transmission and manipulating cultural influence in specific contexts (e.g., Eastern elements < Western elements; Eastern elements = Western elements; Eastern elements > Western elements) to observe dynamic information changes. Additionally, complementarity between different cultural information may make cultural mixing more acceptable and facilitate cultural evolution; future research could control for complementarity (e.g., content-form

complementarity) in experimental materials to explore drivers of cultural evolution.

Regarding the culture-psychology relationship, most cultural psychology research focuses on culture's influence on psychology, whether through cross-cultural comparisons of psychological traits or causal exploration via cultural priming or mixing, emphasizing culture's unidirectional effect on psychology. However, the relationship is bidirectional: culture influences psychology, and psychology simultaneously influences culture. Cultural evolution's cognitive mechanisms have empirically demonstrated that individual psychological and cognitive characteristics indeed affect cultural inheritance and change, usefully supplementing existing cultural psychology research by providing exemplars for examining psychology's influence on culture and offering pathways for more comprehensive investigation of culture-psychology relationships. For example, while existing cultural evolution psychology research has examined cognitive biases' effects, less attention has been paid to personality traits. Recent research (Rawlings et al., 2017) explored relationships between children's personality and their tendency to imitate or innovate, finding that highly agreeable individuals imitate more (seeking behavioral consistency to maintain relationships), highly neurotic individuals (prone to anxiety) also imitate more (seeking consistency to reduce anxiety), and highly open individuals innovate more (enjoying exploration of novel situations). Research on extraversion's relationship with imitation/innovation has been inconclusive: extraversion may increase access to social information for imitation but also may foster competitiveness and creativity test performance, manifesting as innovation. Future research could further explore mechanisms underlying extraversion's relationship with imitation/innovation and adapt transmission chain paradigms to examine how different personality traits affect performance in cultural transmission tasks, investigating personality's influence on cumulative cultural evolution.

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