Does temporal distance influence abstraction?

A large pre-registered experiment

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Abstract

Construal level theory has been extraordinarily generative both within and beyond social psychology, yet the individual effects that form the empirical foundation of the theory have yet to be carefully probed and precisely estimated using large samples and preregistered analysis plans. In a highly powered and preregistered study, we tested the effect of temporal distance on abstraction, using one of the most common operationalizations of temporal distance (thinking about a future point in time that is one day vs. one year from today) and one of the most common operationalizations of abstraction (preference for more abstract vs. concrete action representations, as assessed by the Behavioral Identification Form). Participants preferred significantly more abstract action representations in the distant (vs. near) future condition, with an effect size of d = .276, 95% CI [.097, .455]. We discuss implications, future directions, and constraints on the generality of these results.

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Humans often focus on the current context, thinking about what is happening to the self, here, and now. Yet people are also able to prospect about the future, contemplate distant locations, communicate with dissimilar others, and imagine counterfactual alternatives to reality. Considerable theory and research across social, cognitive, and developmental psychology have examined the mechanisms that enable people to transcend their immediate context to think about distant points in time (e.g., now vs. later), space (e.g., here vs. elsewhere), social distance (e.g., me vs. other), and hypotheticality (e.g., reality vs. counterfactual; Clark & Brennan, 1991; Ledgerwood, Wakslak, Sánchez, & Rees, 2019; Leslie, 1987; Schacter, 2012; Suddendorf & Corballis, 2007; Trope & Liberman, 2003).

One prominent theory, construal level theory, posits that mental abstraction plays a fundamental role in enabling human cognition about psychologically distant objects and events (Gilead, Trope, & Liberman, in press; Trope & Liberman, 2010). According to the theory, when people need to consider something that is more psychologically distant in time, space, social distance, or hypotheticality, they use increasingly abstract (vs. concrete) mental representations that focus on the primary, general, and superordinate features of an object rather than its secondary, specific, and subordinate features. For example, if a person needs to plan a meeting that will take place next year (vs. tomorrow), they might focus more on the high-level features of the meeting (e.g., the intended goal of the meeting is to develop a strategic plan for a business) rather than its low-level features (e.g., the details of how the meeting will take place like a seating plan and specific agenda).

Construal level theory has been extraordinarily influential both within and beyond the borders of social psychology, generating a wealth of empirical research. In their 2015 meta-analysis, Soderberg and colleagues synthesized 125 studies with 310 effect sizes estimating the effect of psychological distance on abstraction (Soderberg, Callahan, Kochersberger, Amit, & Ledgerwood, 2015), and the literature has only grown since. Researchers have also hypothesized and tested a wide variety of implications that the effect of psychological distance on abstraction might have for downstream outcomes in different topic areas, from counterfactual thinking to mimicry and from self-complexity to health behavior (e.g., Choi, Park, & Oh, 2012; Genschow, Hansen, Wanke, & Trope, 2019; Ledgerwood, 2014; Rim & Summervile, 2014; Wakslak, Nussbaum, Liberman, & Trope, 2008; see Soderberg et al., 2015, for a meta-analytic synthesis of 426 effect sizes across 179 studies testing the effects of psychological distance on various downstream consequences of abstraction).

Despite the sizable literature testing the effects of psychological distance on abstraction, very few of these studies have been preregistered and many were conducted using sample sizes that would be considered small by today's standards (see Soderberg et al., 2015, for a comprehensive list of relevant studies largely conducted before recent improvements in research methods and practices). We may therefore know less than we think we know about these effects. Recent discussions about publication bias, p-hacking, and underpowered studies have highlighted the often dramatic extent to which these forces can distort the picture emerging from a given research literature (see Anderson, Maxwell, & Kelley, 2017; McShane, Bockenholt, & Hansen, 2016; Simonsohn, Nelson, & Simmons, 2011). For example, it is extraordinarily difficult to accurately model and account for publication bias once it has occurred, and (perhaps inevitable) inaccuracies in modeling can lead meta-analyses to produce inaccurate estimates of effect sizes (McShane et al, 2016).

Indeed, in light of the recent "revolution" in scientific research practices (Spellman, 2015), any important research literature should be revisiting classic studies and preregistering highly powered tests of the basic components of key theories. To this end, researchers have begun to prioritize well powered, carefully preregistered tests of key theoretical findings, including ego depletion effects, risky choice framing, and delay of gratification, among others (Hagger et al., 2016; Klein et al., 2014; Michaelson & Munakata, 2020). In the present paper, we join this broad initiative to test a key component of construal level theory: namely, the effect of temporal distance on level of abstraction in mental representation.

We chose to focus on temporal distance as the dimension of psychological distance that seems most central to the literature on distance and mental abstraction: Temporal distance formed the basis of the original theory and it is by far the most frequently studied dimension of psychological distance in the literature (Liberman & Trope, 1998; Soderberg et al., 2015; Trope & Liberman, 2003). We selected one of the most common operationalizations of temporal distance (imagining a point in the future that is one day vs. one year from today) and one of the most common measures of abstraction (the Behavioral Identification Form; Liberman & Trope, 1998). Originally developed as a measure to assess individual differences in level of action identification (Vallacher & Wegner, 1989), the Behavioral Identification Form (BIF) is commonly used to assess the abstractness of participants' current mental representations by asking whether participants would prefer to describe each of a series of actions (e.g., "locking a door") in terms of its abstract ends ("securing the house") or in terms of its concrete means ("putting a key in the lock"; Fujita, Henderson, Eng, Trope, & Liberman, 2006; Gunnarsson &

Agerstrom, 2018; Kim, Sung, & Drumright, 2018; Liviatan, Trope, & Liberman, 2008; Nenkov, 2012; Wakslak, Trope, Liberman, & Alony, 2006). Describing an action in terms of its superordinate meaning (why it is performed) is more abstract than describing an action in terms of the subordinate means by which it is performed (Liviatan et al., 2008; Vallacher & Wegner, 1987). Thus, stronger preferences for describing actions in why terms (vs. how terms), as indexed by a higher BIF score, reflect more abstract construal.

Notably, past studies testing the effects of psychological distance on abstraction as assessed by the BIF have yielded some inconsistent results: Whereas multiple studies with relatively small samples have found that distance increases abstraction scores on the BIF (e.g., Liberman & Trope, 1998; Liviatan et al., 2008; Wakslak et al., 2006), one large, unpublished study failed to replicate this result (Bar-Anan, 2009; see Table 1 for a list of the studies outside our lab that to our knowledge have manipulated psychological distance and measured abstraction using the BIF). Moreover, in our own lab, we found inconsistent results in a series of pilot studies that used various formats for the BIF (e.g., showing all 25 items on a single screen versus breaking the items up into multiple screens), leading us to wonder whether the effect would generalize across variations in formatting.

Table 1: Sample sizes (N) and effect size estimates (Hedge's g) for past studies that manipulated psychological distance and measured abstraction using the BIF.

Study citation	Study #	Distance Type	DV	N	Hedge's *g*	95% CI
Bar-Anan (2009)	1	Time (future)	BIF (13 items)	897	-.18	[-.32, -.05]
Darwent (2012)	3	Time (future)	BIF (25 items)	150	.34	[.02, .67]
Fujita et al. (2006)	1	Spatial	BIF (13 items)	68	.54	[.06, 1.02]
Kane et al. (2012)	3	Time (future)	BIF (25 items)	38*	.32	[-.30, 0.95]
Kane et al. (2012)	3	Time (past)	BIF (25 items)	38*	-.31	[-0.94, 0.32]
Liberman & Trope (1998)	1	Time (future)	BIF (18 items)	32	.88	[0.17, 1.59]
Liviatan et al. (2008)	1	Similarity	BIF (19 items)	34	.68	[0.01, 1.36]
Wakslak et al. (2006)	7	Likelihood	BIF (25 items)	26	.84	[0.06, 1.61]

*estimated (N = 76 for the entire study, which manipulated future temporal distance for some participants and past temporal distance for other participants; these two manipulations are separated into two lines to show the effect size for each distance manipulation).

Finally, it would be very useful to have a precise estimate of the size of this effect to inform power analyses for future studies, to ensure that researchers' conclusions can be well calibrated to the informational value of a given study (see Da Silva Frost & Ledgerwood, in press). The Soderberg et al. (2015) meta-analysis estimated the effect size of temporal distance on abstraction to be approximately d = .50, but (like most meta-analyses) found some evidence for publication bias. Just after the meta-analysis was published, new and improved recommendations for discussing publication bias in meta-analysis emerged (e.g., sensitivity analyses that consider multiple models of publication bias and provide a range of possible estimates; see McShane et al, 2016). Given what we now know, it seems likely that the 2015 meta-analysis overestimated the size of the distance-to-abstraction effect. However, it can be difficult to accurately adjust for publication bias once it has contaminated a given literature, because even small differences in modeling assumptions can produce large differences in adjusted meta-analytic estimates (McShane et al., 2016). And, inaccurate effect size estimates create challenges for effective power analysis (Anderson et al., 2017). For all these reasons, we thought it was especially important to conduct a preregistered and well powered test of temporal distance on BIF abstraction scores.

We modeled our study design on previous studies testing the effect of psychological distance on abstraction, using the same manipulation of temporal distance (one day vs. one year from today) and the same measure of abstraction (the Behavioral Identification Form) used in past studies (e.g., Bar-Anan, 2009; Liberman & Trope, 1998). We then tailored several details of the study to ensure that our participants were paying attention and to maximize the strength of the manipulation, based on pilot studies conducted in our lab. We also varied the format of the BIF (all items on a single screen vs. broken into multiple screens) to explore the generalizability of the results across different choices in how to present the materials.

Method

Preregistration and Transparency

We pre-registered our analysis plan, including power analysis, target sample size, and exclusion criteria, on the Open Science Framework (https://osf.io/xs2bw/). All materials, de-identified data, and code are available at the same link (Sánchez & Ledgerwood, 2020).[1]

Participants

Five hundred and twenty UC Davis students completed the study for course credit. They were randomly assigned to one of four cells in a 2 (temporal distance: one day vs. one year from today) by 2 (DV format: single screen vs. multiple screens)

[1] Note that we also preregistered the prediction—based not on theory but on the pattern of results we had observed across a series of relatively small pilot studies—that temporal distance would only influence BIF scores in the single-screen format condition. In the results of the preregistered analysis plan reported below, this prediction was not supported, and we have downgraded our confidence in our tentative notion accordingly. Because this kind of atheoretical preregistered prediction has no bearing on (a) theory falsification or (b) Type I error control (Ledgerwood, 2018; Nosek, Ebersole, DeHaven, & Mellor, 2018), we report it here for the sake of transparency but do not discuss it further in the manuscript.

between-subjects design. We preregistered the following exclusion criteria: Participants would be excluded if they selected the wrong time frame in the attention check (n = 12), entered the incorrect date for the manipulation (n = 23), did not complete the manipulation (n = 0), did not respond to at least 20 of the 25 items that comprised the dependent measure (n = 2), guessed the specific hypothesis that time will influence abstraction (n = 2), or chose the same response throughout the entire study (n = 0). After excluding participants who met one or more of these criteria, analyses were conducted on the remaining N = 485 participants (391 women, 92 men, and 2 unreported; M_{age} = 19.94, SD = 1.95; 161 East Asian, 81 Latino, 67 White, 64 South East Asian, 39 South Asian, 36 Multiracial, 17 Middle Eastern, and the rest choosing a different description).

Sample Size Determination

In a prior study in our lab (N = 175) that used a similar manipulation of temporal distance and the single-screen format version of the dependent measure, we observed an effect size estimate of d = .351. We based our target sample size for the current study on an *a priori* power analysis conducted in G*Power (Faul, Erdfelder, Lang, & Buchner, 2007), which indicated that N = 516 (i.e., N = 258 per format condition) would provide 80% power to detect a simple effect of distance on abstraction of d = .351 within a single format condition.

Power and Precision

As noted above, our actual sample size (following exclusions) was N = 485. A power analysis conducted in G*Power using the same external effect size estimate of d = .351 indicated that our actual sample size would provide over 97% power to detect an overall main effect of distance on abstraction.[2] Importantly, this sample size also exceeds Schonbrodt and Perugini's (2013) recommendation of N = 250 for the minimum sample required to obtain a reasonably precise estimate of an effect when studying an effect size in the range of $r = .10$ to $r = .20$ (equivalent to d = .20 to d = .41).[3] In other words, a sample of this size allowed us to be fairly confident that the estimated size of the effect of temporal distance on abstraction observed in this study would be reasonably close to the true population parameter.

Procedure and Materials

Participants came into the lab and completed the study at individual computer stations in a large room. All survey materials were presented using Qualtrics (see Appendix for full materials).

Temporal distance manipulation. After consenting, participants learned that we were "interested in the way people imagine and plan for upcoming events." We asked them to "travel in time and think about all the things that are going to happen to you" either "1 day from today" (in the *near future* condition) or "1 year from today" (in the *distant future* condition). To ensure that participants thought about the correct point in time, we showed them a reminder of today's date and asked them to select the date for 1 day [vs. 1 year] in the future. Following our preregistration, we excluded participants who entered the incorrect date at this step (e.g., entering a date that was several months in

[2] This power analysis used the "achieved power" option in G*Power, which allows one to input an effect size estimate and sample size and then computes power. When conducting such a power analysis, it is important that the effect size estimate comes from outside the current study (that is, one should not use an effect size estimate from a study to compute what is often called "post-hoc power" for that same study; see Da Silva Frost & Ledgerwood, 2020).

[3] More specifically, N = 485 exceeds even the very large sample size required to achieve with 95% confidence a corridor of stability with width $w = .10$ around an effect size as small as $\rho = .1$ (the most stringent case delineated by Schonbrodt & Perugini, 2013; see Table 1).

the past). To ensure that participants fully engaged with the manipulation, we asked them to "take a minute to imagine what your life will look like tomorrow [next year]." After a minute had passed, the program moved automatically to the next screen.

Abstraction measure. Next, we asked participants to complete the 25-item BIF (Liberman & Trope, 1998; Vallacher & Wegner, 1989) while thinking of their life 1 day [vs. 1 year] from today. Participants in the *single screen format* condition saw all 25 items on a single screen, whereas participants in the *multiple screen format* condition saw five items presented per screen. For each item, participants selected whether they would prefer to describe a given behavior (e.g., "Taking a test") in terms of its abstract ends ("Showing one's knowledge;" coded as 1) or in terms of its concrete means ("Answering questions;" coded as 0). Responses were summed to create an index of action identification ranging from 0 to 25, with higher numbers indicating greater abstraction.

Attention check and other measures. We then asked participants to recall how far away was the point in time we had asked them to imagine (tomorrow, next year, not sure, or other). Following our preregistration, we excluded participants who selected the wrong timeframe (i.e., "next year" in the near future condition or "tomorrow" in the distant future condition). Finally, participants completed several exploratory measures and demographic questions.

Results

We report all statistical tests described in our preregistered analysis plan. The planned 2 (temporal distance: one day vs. one year) by 2 (format: single screen vs. multiple screens) between-subjects ANOVA on BIF score revealed a main effect of temporal distance, $F(1, 481) = 9.13$, $p = .003$, $\eta_p^2 = .019$, no main effect of format, F(1,

481) = .198, p = .656, η_p^2 = .000, and no interaction, $F(1, 481)$ = .000, p = .985, η_p^2 = .000. Participants chose more abstract descriptions in the distant future condition (M = 13.88, SD = 4.72) compared to the near future condition (M = 12.60, SD = 4.53), d = .276, 95% CI [.097, .455]. Figure 1 depicts these results visually and Table 1 provides descriptive information for each item in the scale.

Planned simple effects tests within each format condition found that participants preferred more abstract descriptions when thinking about the distant (vs. near future), both when completing the dependent measure on a single screen, $F(1, 481)$ = 4.61, p = .032, and when completing the dependent measure on multiple screens, $F(1, 481)$ = 4.52, p = .034.

Figure 1. On average, participants chose more abstract descriptions (out of 25 possible on the Behavioral Identification Form) in the distant future condition than in the near future condition. Error bars indicate one standard error above and below the mean; dots indicate individual participant scores (jittered).

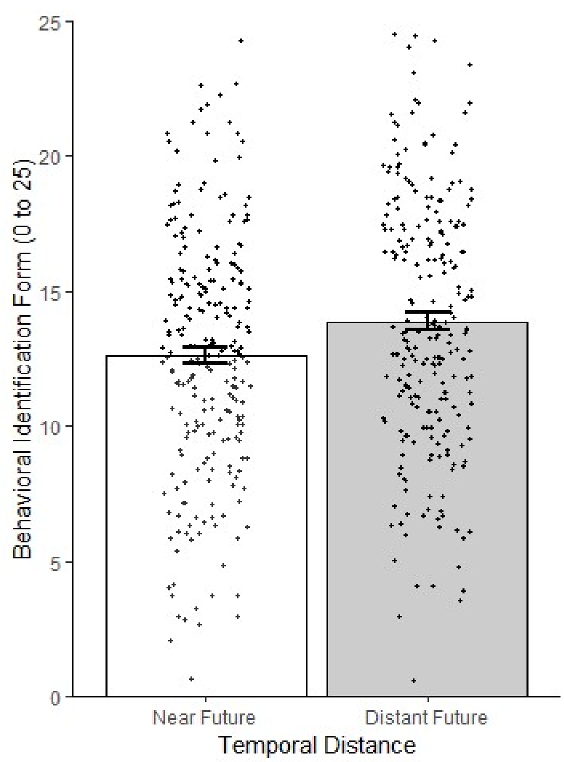

Table 2. Proportion of participants who selected abstract (vs. concrete) identification for activities in the Behavioral Identification Form as a function of temporal distance condition.

Activity	Concrete Identification	Abstract Identification	Near Condition	Distant Condition
Making a list	Writing things down	Getting organized	.50 [.44, .57]	.54 [.47, .60]
Reading	Following lines of print	Gaining knowledge	.63 [.57, .69]	.79 [.74, .84]
Joining the Army	Signing up	Helping the Nation's defense	.53 [.47, .59]	.62 [.56, .68]
Washing clothes	Putting clothes into the machine	Removing odors from clothes	.37 [.31, .43]	.31 [.25, .37]
Picking an apple	Pulling an apple off a branch	Getting something to eat	.78 [.73, .83]	.69 [.63, .75]
Chopping down a tree	Wielding an axe	Getting firewood	.46 [.39, .52]	.53 [.47, .59]
Measuring a room for carpeting	Using a yard stick	Getting ready to remodel	.58 [.52, .64]	.60 [.54, .66]
Cleaning the house	Vacuuming the floor	Showing one's cleanliness	.34 [.28, .40]	.40 [.34, .46]
Painting a room	Applying brush strokes	Making the room look fresh	.54 [.48, .60]	.57 [.51, .63]
Paying the rent	Writing a check	Maintaining a place to live	.52 [.46, .58]	.58 [.51, .64]
Caring for houseplants	Watering plants	Making the room look nice	.17 [.13, .22]	.26 [.20, .31]
Locking a door	Putting a key in the lock	Securing the house	.65 [.59, .71]	.70 [.65, .76]
Voting	Marking a ballot	Influencing the election	.51 [.45, .57]	.50 [.44, .56]
Climbing a tree	Holding on to branches	Getting a good view	.45 [.39, .51]	.54 [.47, .60]
Filling out a personality test	Answering questions	Revealing what you're like	.48 [.42, .54]	.62 [.56, .68]
Toothbrushing	Moving a brush around in one's mouth	Preventing tooth decay	.67 [.61, .73]	.73 [.67, .78]
Taking a test	Answering questions	Showing one's knowledge	.37 [.31, .43]	.42 [.36, .49]
Greeting someone	Saying hello	Showing friendliness	.46 [.40, .53]	.53 [.47, .59]
Resisting temptation	Saying "no"	Showing moral courage	.43 [.37, .50]	.47 [.40, .53]
Eating	Chewing and swallowing	Getting nutrition	.68 [.62, .74]	.68 [.62, .74]
Growing a garden	Planting seeds	Getting fresh vegetables	.35 [.29, .41]	.50 [.44, .56]
Traveling by car	Following a map	Seeing countryside	.53 [.47, .60]	.58 [.52, .64]
Having a cavity filled	Going to the dentist	Protecting your teeth	.36 [.29, .42]	.34 [.28, .40]
Talking to a child	Using simple words	Teaching a child something	.47 [.41, .53]	.59 [.53, .65]
Pushing a doorbell	Moving a finger	Seeing if someone's home	.77 [.72, .82]	.80 [.75, .85]

Note. Values in square brackets indicate the 95% confidence intervals for each proportion. It may be tempting to think that these results can be used to identify a subset of items that are especially sensitive for a new and improved version of the BIF, but notice the wide confidence intervals: Even with our large sample, there is considerable noise at the individual item level, and we recommend that researchers use the full BIF unless and until careful psychometric work is conducted to test the sensitivity of a shorter scale. We see no evidence of floor or ceiling effects.

Discussion

A psychological theory can be conceptualized as a building made of individual bricks, where each brick represents a particular empirical study (Forscher, 1963; Ledgerwood, 2019; Spellman, 2015). In order to build good buildings, it is important to amass solid bricks. Construal level theory has proven to be extraordinarily generative, inspiring research across a wide range of topic areas in psychology and beyond—and yet many of the bricks used to construct the building have yet to be carefully probed for soundness using improved research practices like large samples and preregistered analysis plans that enable greater confidence in study results. The present study represents an important first step in this venture.

The large sample and preregistered analysis plan employed in the current study allows us to be relatively confident that (1) the observed significant effect of temporal distance on BIF scores reflects a true effect rather than a false positive (Da Silva Frost & Ledgerwood, 2020; Lakens & Evers, 2014) and (2) the estimated effect size of temporal distance on abstraction (d = .276) falls within a relatively stable corridor around the true population effect size (Schonbrodt & Perugini, 2013). The former provides a useful and important brick for theory building, suggesting that imagining a more distant future time point (one year vs. one day into the future) can cause people to prefer more abstract (vs. concrete) action identifications. The latter offers valuable methodological information, providing an effect size estimate and confidence interval that can be used in future power analyses that may be more trustworthy than the (likely overestimated) estimate from the Soderberg et al. (2015) meta-analysis (see Anderson et al., 2017, for a discussion of just how problematic overestimated effect sizes can be for power analyses).

Indeed, it is worth noting that Soderberg et al.'s (2015) meta-analytic estimate for the effect of temporal distance on abstraction (*d* = .493) falls outside the confidence interval observed in the current study (95% CI [.097, .455]). Such differences have important consequences for power analyses and the informational value of future studies: For example, a power calculation to determine the minimum sample size needed to achieve 90% power to detect an effect of temporal distance on abstraction would suggest a target sample size of N = 174 if it relied on the meta-analytic estimate (*d* = .493), but a far larger sample size of N = 554 if it instead relied on the present study's estimate (*d* = .276). Our results also have implications for how researchers should think about meta-analyses: They are consistent with recent suggestions that it is difficult to accurately model publication bias and that meta-analytic estimates based on literatures filtered through the lens of publication bias may often be too high (da Silva Frost & Ledgerwood, 2020; McShane et al., 2016). Instead, researchers may wish to take a cautious approach when conducting power analyses based on meta-analytic effect size estimates (see e.g., Anderson et al., 2017) and to focus more on relative effect sizes suggested by moderator analyses rather than absolute effect sizes (Ledgerwood, 2019).

Constraints on Generality

It is important to outline the anticipated boundary conditions for the results observed in the current study, consistent with recent recommendations to include an explicit statement describing the generality of a study's findings (Simons, Shoda, & Lindsay, 2017). We expect that our results will generalize to any U.S. sample of college students who complete the study in person in a research lab. Given that we saw similar results across our two formatting conditions, we also expect that our results will generalize across different choices in how to present the study materials to participants. It would be important for future research to test the extent to which these results generalize across participants at different ages and from different cultures, especially given theory and research suggesting that there may be developmental and cross-cultural differences in both abstraction and how people think about time (e.g., Atance, 2008; Flavell, 1999; Ji, Nisbett, & Su, 2001; Miyamoto, Knoepfler, Ishii, & Ji, 2013).

It also seems important for future research to test whether these results generalize to an online setting. Such research would be crucial to conduct before assuming these results will replicate in online samples, especially given that Soderberg et al.'s (2015) meta-analytic estimate for the effect of psychological distance on abstraction was substantially smaller for studies conducted online (d = .145) than for studies conducted in person in the lab (d = .511; note that these estimates collapsed across all four distance dimensions, not just temporal distance). Indeed, results from a recent set of highly powered replication studies examining prosocial spending and happiness suggest that methodological features such as online versus in person settings (and corresponding differences in participant engagement) can substantially influence effect size estimates, further highlighting the importance of testing the present findings across different research settings (Aknin, Dunn, Proulx, Lok, & Norton, 2020). We have no reason to believe that the present results depend on other characteristics of the participants, materials, or context.

An Agenda for Future Conceptual Replications

Future research should also continue to probe the strength of the relations between other operational definitions of temporal distance and abstraction using large samples, engaging manipulations and attention checks, and preregistered analysis plans. From a methodological perspective, such research might do well to prioritize manipulations that are likely to be stronger and measures that are likely to be more sensitive. For example, Soderberg et al. (2015)'s analysis of the shape of the relation between temporal distance and abstraction suggests that temporal distance manipulations may be stronger when the near time point is further in the future (e.g., two weeks from today instead of one day from today) and when the distance between near and far time points is greater (e.g., a different between time points of two years vs. two months; see also Bhatia & Walasek, 2016; Snefjella & Kuperman, 2015). Likewise, Soderberg et al. (2015) found larger effect size estimates for studies that used relative indicators of abstraction (e.g., relative interest in receiving primary vs. secondary information) rather than indicators that only measured concrete representations (e.g., just interest in receiving secondary information) or abstract representations (e.g., just interest in receiving primary information), suggesting that relative indicators may be more sensitive measures.

From a theoretical perspective, future research might do well to prioritize retesting the effects of temporal distance (and ultimately spatial distance, social distance, and hypotheticality) on other core aspects of abstraction, using methods that can provide important new information about the solidity and size of each of these effects. For example, construal level theory posits that temporal distance will influence not only conceptual measures of abstraction (such as the BIF) but also perceptual measures of abstraction (e.g., relative performance on tasks that require closing the gestalt versus noticing missing details; Trope & Liberman, 2010; see also Wakslak, Trope, Liberman, & Alony, 2006). Likewise, the theory suggests that increasing temporal distance will lead people to prefer more abstract (vs. concrete) modes of communication (i.e., words vs. pictures; Amit, Algom, & Trope, 2009; Trope & Liberman, 2010). By probing the robustness of a wide range of individual effects with cutting-edge methods, future research can help ensure that theorists build the strongest possible buildings from the strongest possible bricks.

Conclusion

Researchers across multiple disciplines have sought to understand the key role that abstraction seems to play in a broad array of basic psychological processes, including language development, communication, categorization, causal inference, and self-regulation (e.g., Badre & d'Esposito, 2007; Rosch, Mervis, Gray, Johnson, & Boyes-Braem, 1976; Trope, Ledgerwood, Fujita, & Liberman, in press; Wigboldus, Semin, & Spears, 2000; see Burgoon, Henderson, & Markman, 2013, for a review). By connecting abstraction to psychological distance, construal level theory provides a broad organizing framework for understanding abstraction as a fundamental tool that humans use to transcend their immediate experience. As a central theory in social cognition, construal level theory both deserves and needs more highly powered studies with preregistered analysis plans and engaging manipulations to ensure that the theory is based on the strongest possible evidence.

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