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Fun Isn't Easy: Children Selectively Manipulate Task Difficulty When "Playing for Fun" Versus "Playing to Win"

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Play is important in many cultures and species, but the basic motivations behind play remain unclear. In two preregistered experiments, we examined what 5- to 10-year-old children ($n = 124$) think makes play rewarding under internally and externally motivated contexts using a novel game design task. We specifically compared children's choices about how to best configure a novel tossing game when either *playing for fun* or *playing to win*. We found that for "win-relevant" variables, children chose easier settings when playing to win than when playing for fun. By contrast, for "win-irrelevant" variables, children generally preferred similar settings across conditions. Children also judged "win-relevant" variables as more important to winning than "win-irrelevant" variables and judged both as irrelevant to having fun. These results suggest that playing to win and playing for fun are distinct motivational contexts to which children can appropriately adapt their decisions during play.

Public Significance Statement
Using a game design task, we report two studies showing that 5- to 10-year-old children selectively decrease game difficulty when playing to win but not when playing for fun. These findings suggest that some play contexts may lead children to be more open to challenges, improving our understanding of how intrinsic and extrinsic motivations guide children's decision making.

Keywords: play, intrinsic motivation, goals, decision making, cognitive development

Supplemental materials: https://doi.org/10.1037/dev0002108.supp

Many creatures play. Lion cubs mock-hunt, otters juggle rocks, dolphins blow bubbles to swim through, and human children spend hours building block towers, swarming playgrounds, and searching for dinosaurs, dragons, and aliens. In addition to humans (Groos, 1901; Piaget, 1951) and other mammals (Groos, 1911; Spinka et al., 2001), play can also be found in many birds, reptiles, fish, and perhaps even insects (Burghardt, 2005, 2015; Galpayage et al., 2022). Human play takes on many forms (Opie & Opie, 1960; Pellegrini & Smith, 1998), appears across a wide variety of human cultures (Edwards, 2000; Gaskins et al., 2007; Samuelsson & Fleer, 2008), and is evident across the historical record (Chudacoff, 2007; Decker, 1992; De Maret & Sidéra, 2015; S. E. Kidd, 2019; Sidéra & Vornicu, 2016).

Despite its prevalence, play remains difficult to characterize. Descriptive accounts generally agree that play is structured; often

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repetitive; most common in youth; most likely when individuals are healthy, relaxed, or bored; irrelevant to immediate survival; and thus intrinsically motivated (Burghardt, 2010). Despite these shared features, play manifests in many diverse behaviors, and different types of play are associated with different developmental benefits: Rough and tumble play leads to more social bonding (Pellis & Pellis, 2007); pretend play improves counterfactual inference (Buchsbaum et al., 2012; Wente et al., 2022); exploratory play leads to discoveries about causal structure (Bonawitz et al., 2012, 2019; Schulz & Bonawitz, 2007; Sobel et al., 2022); and guided play often improves educational outcomes (Skene et al., 2022; Weisberg et al., 2013, 2016; Yu et al., 2018). Furthermore, individuals at play might be motivated by any number of proximal goals, including information gain, mastery, autonomy, meaning-seeking, social connection, self-signaling, novelty, visceral pleasure, and aesthetic experience (Berridge & Kringelbach, 2015; Chater & Loewenstein, 2016; Churchland, 2018; Deci & Ryan, 1980; Fishbach & Woolley, 2022; Haber et al., 2018; C. Kidd & Hayden, 2015; Loewenstein, 1999; Oudeyer et al., 2007; Ryan & Deci, 2017; Skov, 2019; Stanley & Lehman, 2015; Wigfield et al., 2021; Wilson et al., 2021). Given this diversity of play behaviors, theoretical accounts often aim to explain only particular kinds of play (e.g., Chu & Schulz, 2020; Rubin et al., 1983; Zosh et al., 2018).

Because the theoretical understanding of play is so fractured, many basic questions about play remain unanswered. One prominent question has to do with the rewards underlying play. While nearly all current theories and definitions of play assume that play behavior is intrinsically motivated (Andersen et al., 2023; Chu & Schulz, 2020; Groos, 1901; United Nations (Convention on the Rights of the Child), 2013; Zosh et al., 2018), very little work has empirically investigated exactly what children think makes play rewarding. Previous research has predominantly used structured interviews to ask children what they think "play" means or to compare children's descriptions of play against other activities such as work and learning (Howard, 2002; Keating et al., 2000; Letourneau & Sobel, 2020; Wing, 1995). This research has found that preschool-aged children commonly associate play with specific activities (e.g., running, sliding) and objects (e.g., balls and dolls; Rothlein & Brett, 1987), as well as positive affect and free choice (e.g., Howard, 2002; Robson, 1993; Rothlein & Brett, 1987). While such methods have allowed researchers to chart how children's descriptions of play vary with age or experience, they rely on children's ability to recognize or generate specific play examples and may not fully capture children's understanding of what makes play fun nor what children decide to do when presented with the opportunity to play.

Another approach is to directly ask children how much they enjoy different activities and to identify which task features best explain children's ratings (e.g., Malone, 1981; Malone & Lepper, 1987). While this approach allows researchers to carefully quantify children's reactions to particular game features, generalizing these findings across the vast space of possible game design features would require asking participants about the exponentially large set of all possible games.

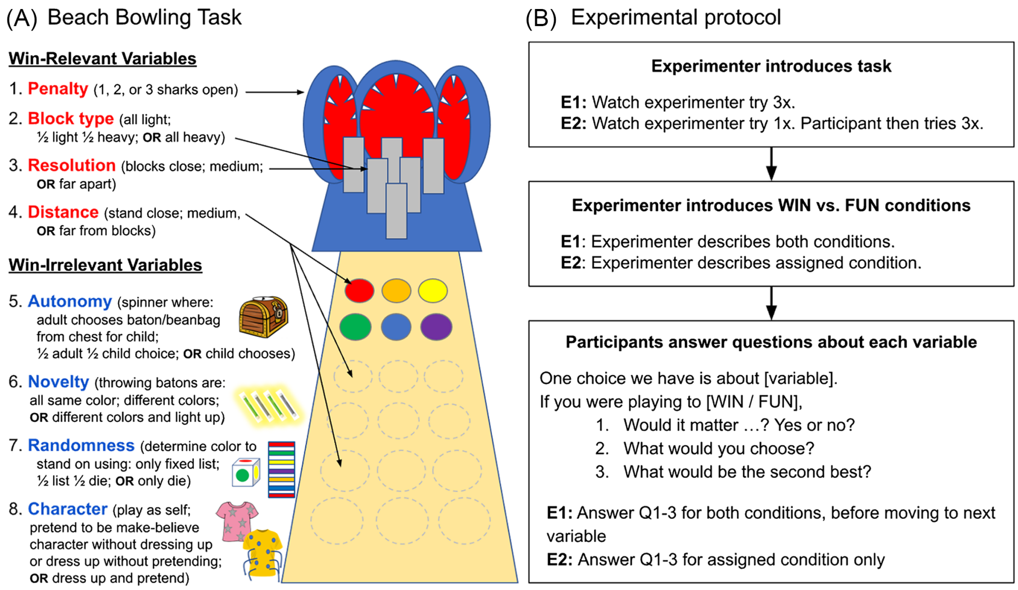
Here, we investigate what 5- to 10-year-old children think makes a game fun to play using a novel game-design task. Instead of measuring how children describe or rate preexisting games, in this task, we allowed children to manipulate the game's features to their liking and compared children's design decisions under different play motivations (i.e., "have fun" or "win the game"). We built our paradigm around structured game design for two reasons. First, rule-based games are a significant form of play for school-aged children (Opie & Opie, 1960; Taylor, 1999). Children often enjoy inventing their own games (Castle, 1990, 1998), suggesting that game design is a natural way to elicit children's preferences and reasoning about different choices. Second, games are a particularly good place to look for systematic variation in children's decisions under different motivational contexts to play. Unlike the complex, improvisational, and highly varied forms of pretense, motor, and exploratory play that are common in preschoolers, game playing is structured around the requirement to follow the rules of the game itself (whether well-established or invented spontaneously). Games often come with systems of reward and punishment and, critically, clear conditions for winning. These structural features of games have recently been explained as a way for players to explore various kinds of agency—different constellations of goals, abilities, and constraints—in a relatively controlled environment (Nguyen, 2020). What is important for our purposes is that the relatively restricted degrees of freedom inherent to structured games enable us to more directly assess children's decision making given different motivational contexts, rather than trying to infer it from spontaneous behavior.

Our primary question is how different play motivations impact children's choices along different game-design variables (see Figure 1). Specifically, we contrast *playing for fun* with *playing to win*. These two objectives represent opposing kinds of motivation—the former is defined internally by the player, whereas the latter is defined by external outcomes (Lepper & Henderlong, 2000; Ryan & Deci, 2020). We consider three hypotheses. First, if playing for fun ultimately is playing to win, then children in both motivation conditions should choose settings that maximize the likelihood of winning. Alternatively, children might selectively choose harder game settings when playing for fun, similar to how adults' task enjoyment is strongly predicted by the experience of optimal challenge (e.g., when playing a moderately superior opponent in chess; Abuhamdeh & Csikszentmihalyi, 2012). Consistent with this, children seem to challenge themselves more when engaging in activities without performance pressure (Harter, 1978). Finally, a third, non-mutually exclusive possibility is that playing for fun reduces children's motivation to win while simultaneously increasing other intrinsic motivations (e.g., for novelty or autonomy). If so, children may prefer a different configuration of win-irrelevant variables when playing for fun than when playing to win.

We ran two preregistered experiments to test these hypotheses about whether children would selectively manipulate different game features when playing for different motivations. In both experiments, we allowed children to modify both win-relevant and win-irrelevant game variables. Win-relevant variables allowed children to make the game easier or harder (e.g., by adjusting distance from goal or risk of incurring penalties; Figure 1). In contrast, win-irrelevant variables, commonly associated with play (e.g., novelty, autonomy; Figure 1), have no bearing on the probability of winning the game.

In addition to these broad hypotheses about how children respond to different play motivations, it is possible that there are developmental differences in how children conceptualize play itself (e.g., Letourneau & Sobel, 2020), such that across conditions, older children might make different game design decisions than younger children. We therefore tested children across ages 5–10 and additionally asked them to judge whether each variable mattered for the

Figure 1
Stimuli and Protocol for Experiments 1 and 2



Note. Panel A: Schematic diagram of the Beach Bowling task, where participants toss batons from different positions on the yellow runway. Participants earn points for knocking down rectangular blocks but incur penalties for landing batons inside the sharks. Participants can modify the game along four win-relevant variables (No. 1–4, in red) which affect task difficulty and four win-irrelevant variables (No. 5–8, in blue) which do not affect task difficulty. Each variable offers three possible settings, listed low to high. Panel B: Overall protocol for Experiment 1 (E1) and Experiment 2 (E2). An experimenter introduces the Beach Bowling task and two conditions: *to win stickers* (WIN) or *have as much fun as possible* (FUN). Then, participants answer three questions about each variable. Condition was manipulated within-subjects in Experiment 1 but between-subjects in Experiment 2. See the online article for the color version of this figure.

two motivations, thus providing an explicit measure of what children think is important for fun and for winning. This approach is also motivated by other work showing that younger children might be less sensitive to task difficulty when choosing or evaluating activities (Chu & Schulz, 2023; Zhang et al., 2025).

Experiment 1

In Experiment 1, we asked children how to best configure a novel game. We varied whether the game emphasized playing for fun (Fun, i.e., "have as much fun as you can") or emphasized playing to win (Win, i.e., "knock down blocks to win stickers"). We used a within-subjects design: Each participant answered the same questions under both conditions, with condition order counterbalanced across participants.

In our activity, "Beach Bowling" (Figure 1A), participants try to knock down blocks by throwing bean bags and batons. We introduced children to eight ways of changing the task. Critically, some changes were win-relevant, and others were win-irrelevant. Win-relevant changes affect the likelihood of success (e.g., throwing distance), while win-irrelevant changes did not (e.g., color of batons). Instead, win-irrelevant changes varied dimensions commonly associated with play, such as novelty and autonomy. We then asked children how to best design the activity, either for winning stickers or for having fun. We also collected participants' explicit judgments about how important each variable was in achieving these ends. This allowed us to test both how sensitive children are to the features that matter for playing to win and also in what ways playing for fun might go beyond playing to win.

Method

Participants

Participants were 80 English-speaking children (45 female) aged 5–10 years (M_{age} = 7.68, SD = 1.41) from summer camps and children's museums in a major U.S. city. Condition order was counterbalanced (40 Win-first, and 40 Fun-first), and we aimed to sample across the age range by recruiting similar numbers of younger 5- to 7-year-olds (n = 43) and older 8- to 10-year-olds (n = 37). Demographic data such as ethnicity were not collected, although museum visitor statistics suggest a predominantly White (49%) and Asian (17%) sample. The sample size was chosen to yield 80% power to detect a medium difference between the Win and Fun conditions, based on an estimate from pilot data collected with n = 34 participants. Five additional children were excluded for incomplete responses (n = 2) or experimenter error (n = 3).

Task Design and Materials

In our "Beach Bowling" activity, participants tossed bean bags and batons to knock down blocks on a rectangular court (2.7 m long × 1.7 m wide). Children could modify the activity by setting eight variables: four win-relevant variables that affected the likelihood of knocking down blocks and four win-irrelevant variables that did not affect game difficulty but are common features of children's everyday play (e.g., colorful objects, dressing up, rolling dice, spinning a wheel), emphasizing lighthearted engagement and autonomy of choice (Mukherjee et al., 2023). Each variable could be set at one of three possible values (e.g., one, two, or three sharks to avoid). Win-relevant variables all included one "easy," one "medium," and one "hard" value, determined by pilot testing. Figure 1A shows the activity and possible settings for each variable; see Supplemental Materials: A for additional details.

Procedure

Our procedure complied with all relevant ethical regulations and was approved by the Committee for the Protection of Human Subjects at University of California, Berkeley where the study was conducted. Participants and/or guardians provided informed consent. Two experimenters tested children in an outdoor area. The primary experimenter introduced children to the task and then asked about their game design preferences (Figure 1B; see full script at https://osf.io/mcr3q/files/uz49n).

Introduction Phase. First, Experimenter 1 described Beach Bowling as an activity where "we try to knock down some blocks." Children then watched Experimenter 2 demonstrate Beach Bowling while Experimenter 1 narrated their actions. Experimenter 2 made three tosses, making sure to always land one bean bag in a shark's mouth as Experimenter 1 commented, "Uh oh! Not good … Now they can't get it back!"

Next, Experimenter 1 introduced the two game conditions (Win and Fun), saying (critical manipulations underlined): "Now that you know what it looks like to play Beach Bowling, let me tell you something. There are actually two different ways to play this game. One way to play this game is to play to win stickers. If we play to win stickers, then the rule is that you need to knock down all six blocks in order to get some stickers. If you do not knock down all six blocks, then you do not get any stickers at all. The other way to play this game is just for fun. If we play for fun, there are no prizes for knocking down the blocks, and the rule is that you need to have as much fun as possible."

Choice Phase. Experimenter 1 explained that children would answer a series of forced-choice questions about how to set up the game. Experimenter 1 asked about each of the eight variables in turn, as Experimenter 2 recorded the child's response. All questions were presented with visual cue cards showing simple schematic illustrations of the choices.

For each variable, children first learned about the three choices. The choices were presented in either randomized order (for win-irrelevant variables) or in increasing order of difficulty (for win-relevant variables). Because we can clearly identify the impact a change is likely to have on winning, all win-relevant choices were described as "easy," "medium," and "hard," so that children did not need to make this inference themselves. We cannot do the same for win-irrelevant choices, as they do not affect the likelihood of winning (by design), and we do not know what exactly children are optimizing for when they seek to have fun. Higher settings for these dimensions are intended to provide more of the feature associated with the dimension (e.g., the highest setting of randomness injects more randomness into the game than the middle setting, which injects more than the lowest setting), but we do not claim that children should optimize them in a given direction. We therefore opted not to bias children's judgments by labeling the win-irrelevant choices in any particular way.

After the variable was introduced, children answered three questions in fixed order. We prefaced every question with a reminder of the relevant condition, saying, "If you were playing to make sure that you [knock down all the blocks to win stickers/have as much fun as possible]." First, Experimenter 1 asked children whether that variable "mattered" for the condition (i.e., for having fun or knocking down blocks). Next, Experimenter 1 asked for children's first preference. Options were presented in the same order as when first introduced. Finally, Experimenter 1 prompted children for their preference among the remaining two options. These three questions were then repeated for the other condition (Win or Fun), before moving to the next variable.

The entire sequence (variable introduction and six questions) was repeated for the remaining variables such that children answered 48 questions in total. The order of the variables was randomized for each participant by shuffling the cue cards, and children were randomly assigned to always receive either Win or Fun questions first (Supplemental Materials: B analyzes condition order effects). After these questions, Experimenter 1 concluded the procedure by asking whether children would rather play for fun or try to win.

Transparency and Openness

This experiment's design, sampling plan, and analysis were preregistered (see https://doi.org/10.17605/OSF.IO/ETUPW). Deidentified data, codebooks, and R analysis code, as well as the experiment script, can be found on the project Open Science Framework page (see https://doi.org/10.17605/OSF.IO/MCR3Q). All materials are easily obtainable (see list of parts in Supplemental Materials: A).

Results

To understand the effect of motivation context on task selection, we examined three aspects of children's decisions. First, we examined children's preferred game settings. Second, we examined which variables children explicitly judged to be important. Finally, as an exploratory analysis, we examined correlations between children's preferred game settings and the importance judgments.

We initially preregistered a series of analysis of variance and pairwise t tests to examine how children's choices varied by condition and how the effect of condition might be moderated by variable type and age. However, after data collection, we realized that taking a mixed-effects regression approach would more appropriately account for the correlational structure in our repeated measures design. This change in analytical method resulted in no change to conclusions. So, for each analysis below, we first report the best fit model and any significant model-estimated coefficients. We then report preregistered tests on the raw data, as well as descriptive statistics, to aid in interpreting the regression coefficients. We fit models using the *lme4* R package (Bates et al., 2015). For models including age as a covariate, we first transformed age (in months) into z-scores to aid model convergence.

Game Setting Choices

Our primary research questions center on whether participants will choose different game settings when prompted to play to win versus play for fun. Following preregistered plans, for each variable, we assigned one point for choosing the lowest or easiest setting and three points for the highest or hardest setting. For win-relevant variables, a higher score indicates a preference for more difficult challenges. For win-irrelevant variables, a higher score indicates a preference for greater amounts of autonomy, novelty, randomness, or playing as a different character. We computed children's preference score for each variable by calculating a weighted average of their first and second choice preference (score = ⅔ × first + ⅓ × second). By including both responses, these results capture more information about children's preferences and thus strongly test the hypothesized condition effect. (Supplemental Materials: C shows similar results when considering only children's first choice).

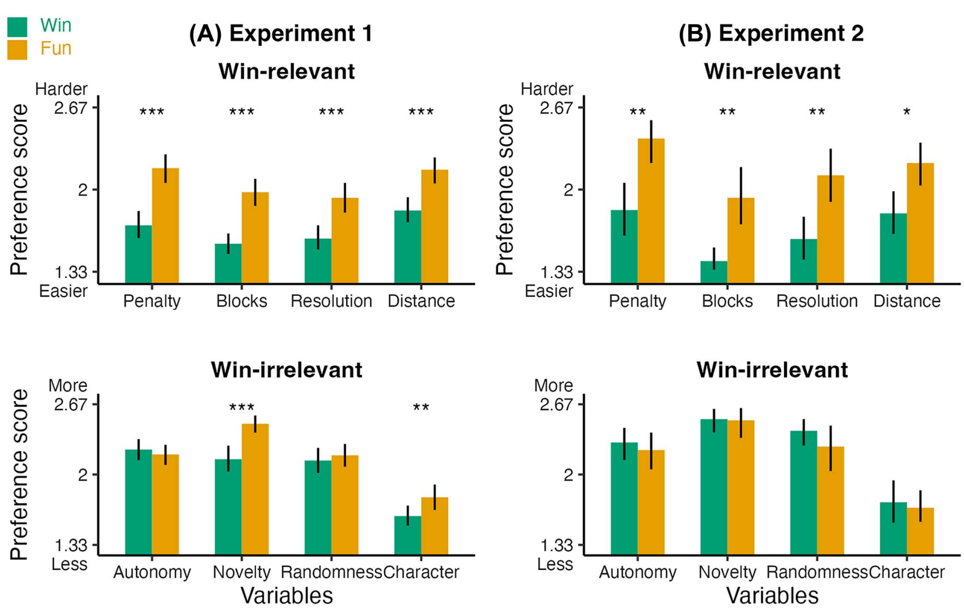
Children's preferred game settings are shown in Figure 2A. We modeled children's preference score using mixed-effects linear regression with fixed effects of condition (0 = *Win*, 1 = *Fun*), variable type (0 = *win-relevant*, 1 = *win-irrelevant*), age (in months, *z*-scored), and their interactions, as well as random intercepts for subjects and items. The best fit model included all main effects and two-way interactions (see Supplemental Table S3 for details).

First, we examine how children respond to condition and variable type. As predicted, children's preferences differed between the two conditions ($\beta_{\text{Fun-Win}} = 0.39$, 95% confidence interval, CI [0.32, 0.46], $p < .001$). On average, children chose higher settings when playing for fun ($M_{\text{Fun}} = 2.11$, $SD = 0.25$) than when playing to win, $M_{\text{Win}} = 1.85$, $SD = 0.23$; Cohen's $d = 0.82$, paired $t(79) = 7.37$, two-tailed $p < .001$. However, this condition difference was greater for win-relevant variables than win-irrelevant variables, as revealed by a significant condition by variable type interaction ($\beta_{\text{Fun*Win-irrelevant}} = -0.26$, 95% CI [−0.36, −0.16], $p < .001$). On win-relevant variables, children chose higher difficulty settings when playing for fun ($M_{\text{Fun}} = 2.06$) than when playing to win, $M_{\text{Win}} = 1.67$; $d = 0.73$; paired $t(79) = 6.51$, two-tailed $p < .001$, with significant condition differences on all four win-relevant variables (*p*s < .001, paired two-tailed *t* tests with Bonferroni correction). Children's choices also differed on win-irrelevant variables, $d = 0.39$, paired $t(79) = 3.51$, $p < .001$, though this was driven by a subset of variables. When setting up the game to maximize fun, compared to winning, children chose slightly higher levels of novelty, $M_{\text{Fun}} = 2.48$, $M_{\text{Win}} = 2.15$, $p < .001$, and character ($M_{\text{Fun}} = 1.78$, $M_{\text{Win}} = 1.60$; $p = .003$), but similar levels of autonomy ($M_{\text{Fun}} = 2.19$, $M_{\text{Win}} = 2.24$, $p = 1$) and randomness ($M_{\text{Fun}} = 2.18$, $M_{\text{Win}} = 2.13$, $p = 1$; all paired two-tailed *t* tests with Bonferroni correction).

These results are consistent when looking at responses by individuals. A significant majority of children (67.5%, binomial $p = .002$ against chance of 50%) chose higher difficulty win-relevant settings when playing for fun than when playing to win. In

Figure 2

Children's Preferred Game Settings for Each Variable, Organized by Variable Type (Win-Relevant vs. Win-Irrelevant) and Condition (Win vs. Fun)



Note. In (Panel A) Experiment 1, participants responded to all eight variables under both conditions. In (Panel B) Experiment 2, participants were randomly assigned to condition and responded to all eight variables for either the Win or Fun condition. Preference scores range from 1.33 to 2.67 as they were computed as the weighted average of each child's first and second choices (⅔ * first + ⅓ * second). Higher scores reflect harder settings on win-relevant variables (top row) and higher levels of autonomy, novelty, character, or randomness on win-irrelevant variables (bottom row). In both experiments, we found that children preferred higher difficulty settings on win-relevant variables in the Fun condition than the Win condition. For win-irrelevant variables, children chose similar settings regardless of condition. See the online article for the color version of this figure.
Asterisks indicate significance of Bonferroni adjusted *p* values from two-tailed *t* tests; * $p < .05$. ** $p < .01$. *** $p < .001$.

contrast, on win-irrelevant variables, only 56% of children chose higher settings when playing for fun than when playing to win (binomial $p = .31$).

We next looked at potential individual differences by age (see Supplemental Materials: D, Figure S3a; see also Supplemental Materials: E for analyses by gender). While age was not correlated with choices in general, Pearson's $r(78) = .16$, $t(78) = 1.42$, $p = .16$, the regression analysis revealed a significant Age × Condition interaction (β = 0.09, 95% CI [0.04, 0.014], $p < .001$). Specifically, age was positively correlated with the condition difference (Fun–Win) in preferred settings, $r(78) = 0.29$, 95% CI [0.075, 0.48], $p = .009$, with older children showing more sensitivity to condition. Nonetheless, even the youngest participants (exploratory analysis with $n = 24$ 5- and 6-year-olds) were sensitive to condition, preferring easier win-relevant settings when playing to win than when playing for fun, $d = 0.61$, paired $t(23) = 2.98$, two-tailed $p = .007$.

We also found a significant Age × Variable Type interaction (β = −0.08, 95% CI [−0.13, −0.03], $p = .002$; see Supplemental Figure S3a). In general, older children were more likely to choose harder win-relevant settings, $r(78) = 0.25$, 95% CI [0.03, 0.44], $p = .028$, but age did not predict win-irrelevant choices, $r(78) = −0.05$, 95% CI [−0.27, 0.17], $p = .67$.

"Does It Matter" Judgments

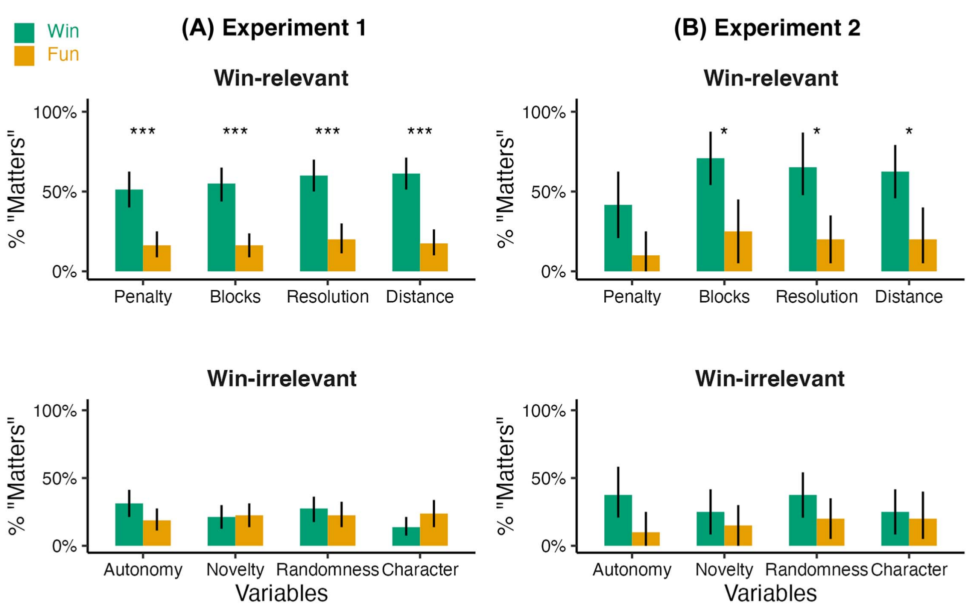
In this preregistered analysis, we modeled children's relevance judgments using mixed-effects logistic regression with fixed effects of condition, variable type, age, as well as random intercepts for subjects and items. The best fit model included all main effects and interactions among fixed effects (including the three-way interaction; see Supplemental Table S4 for details).

Children's explicit judgments about whether each game setting mattered (Figure 3A) reflected an interaction between variable type and condition (β = 2.57, $OR = 13.06$, 95% CI [6.75, 25.26], $p < .001$). When playing to win, children judged that win-relevant variables ($M = 57\%$) would matter more than win-irrelevant variables ($M = 23\%$), $d = 0.84$, paired $t(79) = −7.27$, $p < .002$. However, in the Fun condition, children did not distinguish the importance of win-relevant ($M = 18\%$) and win-irrelevant variables, $M = 22\%$, $d = 0.06$, paired $t(79) = 1.41$, $p = .16$, judging both types to not matter ($ps < .001$ against chance of 50%). Comparing both conditions, children judged that win-relevant variables would matter more when playing to win ($M = 57\%$) than when playing for fun, $M = 18\%$; $d = 0.72$, paired $t(79) = 7.52$, $p < .001$, but they did not differentiate win-irrelevant variables by condition, paired $t(79) = 0.52$, $p = .6$. Altogether, children's explicit valuation of available game settings reflected their preferred game setting choices.

Critically, we also found a significant three-way interaction between age, variable type, and condition (β = 1.38, $OR = 3.96$, 95% CI [2.04, 7.70], $p < .001$). Older children were more likely to recognize the importance of win-relevant variables when playing to win, Pearson's $r(78) = 0.36$, 95% CI [0.15, 0.54], $p = .001$, but not when playing for fun, $r(78) = −0.10$, $p = .37$. Age did not predict relevance judgments of win-irrelevant variables in either condition,

Figure 3

Proportion of Children Responding "Yes" to the Question, "Does It Matter?" by Variable Type (Win-Relevant/Irrelevant) and Condition (Win/Fun), for (Panel A) Experiment 1 and (Panel B) Experiment 2



Note. We found similar results in both experiments. Overall, children had a bias to respond "no" and judged that win-irrelevant variables did not matter regardless of condition. Critically however, children were more likely to judge that win-relevant variables matter when trying to win than when playing for fun. See the online article for the color version of this figure.
Asterisks indicate significance of Bonferroni adjusted p values from two-tailed t tests; $^{*}p < .05$. $^{***}p < .001$.

$r_{\text{Win}}(78) = -0.16$, $p = .15$; $r_{\text{Fun}}(78) = -0.07$, $p = .53$. These developmental trends are shown in Supplemental Figure S3b.

Choice of Game

At the end of the study, we asked children whether they would rather play for fun or try to win. Participants were evenly split between playing for fun (43%) and playing to win (53%, binomial $p = .26$; one child excluded for failing to respond). These results suggest that both fun and winning are valuable goals for children. In an exploratory analysis, we examined if children's game preference would explain variability in their responses to earlier questions. However, adding game preference as a covariate to the earlier regression models did not significantly improve model fit for predicting either children's preferred game settings, $\chi^2(1) = 3.06$, $p = .08$, or their relevance judgments, $\chi^2(1) = 0.01$, $p = .93$ (see Supplemental Materials: D for details). Thus, children did not choose harder settings when playing for fun just because they thought fun is more rewarding than winning or judge that win-relevant variables matter just because they prefer winning to having fun. Instead, the differences in their choices reflect differences in the underlying motivational context, showing both that children can reason accurately and explicitly about variables influencing the probability of winning and that there is an important sense in which playing for fun goes beyond playing to win.

Discussion

Using a novel game design task, we found that 5- to 10-year-old children preferred easier win-relevant settings when playing to win than when playing for fun. Children also judged that win-relevant variables were important when playing to win but not when playing for fun. In contrast, children were less likely to distinguish win-irrelevant variables by condition: Children chose similar win-irrelevant settings in both conditions for two out of four variables and judged that all four win-irrelevant variables were not important under both motivations. Together, these findings show that children selectively manipulate task difficulty, but not other game variables, when playing to win as compared to playing for fun. This replicates prior work showing that in the absence of extrinsic rewards, children are more likely to seek challenges (e.g., Lepper & Greene, 1975) and are compatible with the broader hypothesis that children can flexibly reason about and manipulate tasks along multiple dimensions to suit different motivations.

When playing for fun, children did not selectively modify game features commonly associated with play, such as autonomy or uncertainty. Children also generally responded that these win-irrelevant variables were not important to playing for fun. One possibility is that children may have come up with diverse goals beyond the experimenter-provided goal of knocking down the blocks, thus pursuing "fun" in other ways. When given a chance to play the game at the end however, all children tried to knock down the blocks, suggesting they were reasoning within the game-defined goals, at least for the duration of the study.

Experiment 2

While the results of Experiment 1 advance our understanding of what children think makes a game fun to play, there are at least two limitations. First, the within-subjects design may artificially inflate condition differences: Because children heard both options, they might have assumed that they were supposed to respond differently across conditions for all questions. Second, participants lacked personal experience with the Beach Bowling game prior to making their judgments. We address both concerns in Experiment 2.

To test the robustness of results from Experiment 1, in Experiment 2 we replicate Experiment 1 using a between-subjects design. We also let children try the activity with all settings at "medium" before responding. This ensures that children are familiarized with the task mechanics and allows us to analyze how children in different conditions would modify the game relative to this common baseline.

Method

Participants

We recruited $n = 44$ English-speaking children (27 female) aged 5–10 years ($M = 7.19$, $SD = 1.39$) from the same sites as in Experiment 1. Participants were randomly assigned to condition (between-subjects; Win $n = 24$, Fun $n = 20$). Four additional children were excluded for disinterest or asking to stop the activity. The sample size was chosen based on the effect size observed in pilot data with $n = 15$ participants.

Materials and Procedure

Our procedure complies with all relevant ethical regulations and was approved by the Committee for the Protection of Human Subjects at the University of California, Berkeley where the study was conducted. Participants and/or guardians provided informed consent. We used the materials from Experiment 1 and made two key changes to the procedure. First, after an experimenter demonstrated Beach Bowling, but before any variables were introduced, children completed three tosses themselves, with all "medium" settings. Second, we used a between-subjects design. After a child had completed three tosses, Experimenter 1 told them the "rules" of the condition to which they were randomly assigned: "Now that you know how to play Beach Bowling, let me tell you something else. There is actually a rule for this game. The rule of this game is that you need to have as much fun as you can/knock down all the blocks to win stickers." Experimenter 1 then introduced the critical task: "You get to make some choices about how to set up the game in order to have as much fun as you can/knock down all the blocks to win stickers. Ok?" The remainder was identical with Experiment 1, but children were asked only about the condition to which they had been assigned. Children in Experiment 2 thus answered 24 questions compared to 48 in Experiment 1.

Transparency and Openness

This experiment's design, sampling plan, and analysis were preregistered (see https://osf.io/kra94/overview). Deidentified data, codebooks, and R analysis code, as well as the experiment script, can be found on the project Open Science Framework page (see https://doi.org/10.17605/OSF.IO/MCR3Q). All materials are easily obtainable (see list of parts in Supplemental Materials: A).

Results

Game Setting Choices

Children's preferred game settings are shown in Figure 2B. As in Experiment 1, we calculated each participant's preference score as a weighted average of their first and second choices for each variable, before aggregating by variable type (win-relevant or irrelevant) within each condition. We modeled children's preference score using mixed-effects linear regression with fixed effects of condition, variable type, age, and their interactions, as well as random intercepts for subjects and items. Model comparison using likelihood ratio tests found that none of the interaction terms involving age improved model fit, so these were excluded from the final model. The best fit model therefore included all main effects and the interaction of Condition × Variable Type (see Supplemental Table S4).

As predicted and replicating Experiment 1, children's preferences differed between the two conditions ($\beta_{\text{Fun-Win}} = 0.22$, 95% CI [0.13, 0.31], $p < .001$). Collapsing across all eight variables, children in the Fun condition chose higher settings ($M_{\text{Fun}} = 2.17$) than children in the Win condition, $M_{\text{Win}} = 1.96$, $d = 1.36$, $t(37.5) = 4.28$, two-tailed $p < .001$. However, this was moderated by a significant Condition × Variable Type interaction ($\beta = -0.41$, 95% CI [−0.53, −0.28], $p < .001$). On win-relevant variables, children strongly preferred more difficult settings when playing for fun ($M_{\text{Fun,Win-relevant}} = 2.17$) than when playing to win, $M_{\text{Win,Win-relevant}} = 1.66$, $d = 1.67$, $t(35.3) = 5.22$, two-tailed $p < .001$, and this effect was robust across all four win-relevant variables. Unlike in Experiment 1 however, children chose similar win-irrelevant settings in both the Fun ($M_{\text{Fun,Win-irrelevant}} = 2.18$) and Win conditions, $M_{\text{Win,Win-irrelevant}} = 2.25$, $d = 0.37$, $t(36.3) = 1.18$, $p = .24$, indicating that the external reward context did not influence children's preferences for novelty, randomness, autonomy, or character. Thus, controlling for age, children chose different settings on win-relevant variables depending on condition but made similar choices on win-irrelevant variables in both conditions. These results also hold when controlling for gender. For a detailed analysis of how response varies by age and gender, see Supplemental Materials: D and E.

Preference Shift From Baseline Attempt

In Experiment 2, children played the game at "medium" settings before being assigned to a condition and answering questions. Thus, we can look at how children's first choice preference compares to their baseline experience and how this shift might differ by condition.[1] As planned, we computed a "shift" score for each variable, defined as the change from baseline setting ("2") to children's first choice preference. This score ranged from −1 to +1. For example, a child who chose the highest difficulty setting ("3") as their first response would be coded as making *a* + 1 shift from baseline.

Overall, children chose the lowest setting as their first choice more often when playing to win ($M_{\text{Win}} = 3.12$ of eight variables) than when playing for fun ($M_{\text{Fun}} = 1.65$), $\chi^2(5) = 17.1$, $p = .004$. Critically, these choices differed by variable type. On win-relevant variables, children preferred significantly easier settings than baseline when playing to win, mean shift = −0.47, $t(23) = -5.48$, two-tailed $p < .001$, but significantly harder settings than baseline when playing for fun, mean shift = +0.3, $t(19) = 2.90$, $p = .009$, reflecting a strong condition effect, $t(38.8) = 5.72$, two-tailed $p < .001$. On win-irrelevant variables however, children preferred significantly higher settings than baseline in both conditions, mean shift in Win = +0.38, $t(23) = 6.04$, $p < .001$; Fun = +0.21, $t(19) = 2.90$, $p = .009$, with no difference in shift magnitude across conditions, $t(39.8) = 1.78$, $p = .083$. In summary, these results replicate Experiment 1 in finding that children selectively modify win-relevant variables to optimize for ease when playing to win, but not when playing for fun, while treating win-irrelevant variables similarly in both conditions.

"Does It Matter" Judgments

Children in Experiment 2 also recognized that the importance of win-relevant and win-irrelevant variables depends on the game condition (see Figure 3). The best fit mixed-effects logistic regression model predicting children's relevance judgments in Experiment 2 included fixed effects of condition, variable type, age, and all two-way and three-way interactions, as well as random intercepts for subjects and items (see Supplemental Table S5).

A significant Condition × Variable Type interaction ($\beta = 1.56$, $OR = 4.78$, 95% CI [1.19, 19.22], $p = .03$) revealed that when playing to win, children judged win-relevant variables ($M_{\text{Win,Win-relevant}} = 62\%$) to matter more than win-irrelevant variables ($M_{\text{Win,Win-irrelevant}} = 31\%$), $d = 0.84$, paired $t(22) = -3.37$, $p = .003$. Conversely, children in the Fun condition judged all variables to be unimportant, with no difference between win-relevant ($M_{\text{Fun,Win-relevant}} = 19\%$) and win-irrelevant variables ($M_{\text{Fun,Win-irrelevant}} = 16\%$), $d = 0.08$, paired $t(19) = 0.33$, $p = .75$.

Replicating Experiment 1, here we also found a significant three-way interaction between age, condition, and variable type ($\beta = 2.65$, $OR = 14.16$, 95% CI [2.91, 68.95], $p = .001$). Older children were less likely to respond that win-irrelevant variables are important when playing to win, $r(22) = -0.41$, 95% CI [−0.70, −0.003], $p = .049$, consistent with an improved understanding that these variables do not affect the likelihood of winning. Age was not significantly correlated with judgments of win-relevant variables (see Supplemental Figure S4), though the trends are consistent with an increased appreciation that win-relevant variables matter more when playing to win than playing for fun.

General Discussion

In two experiments, we asked 5- to 10-year-old children to set up a novel game when playing to win or when playing for fun. Results from two experiments show that children clearly distinguish the two motivational contexts. Children selectively manipulated win-relevant settings, making the game harder when playing for fun than when playing to win, but chose similar win-irrelevant settings in both conditions. This suggests that playing for fun optimizes for something other than externally defined outcomes, such as knocking down all the blocks or obtaining prizes. This is supported by children's explicit judgments that win-relevant variables matter less when playing for fun. In fact, children typically judged that both win-relevant and win-irrelevant variables "did not matter" when playing for fun, leaving

[1] We preregistered an analysis predicting the direction and magnitude of shift in preferred setting given children's initial success at the game. However, constraints on camera positioning prevented us from coding how many blocks children hit during familiarization.

open the question of exactly what kinds of intrinsic rewards play might optimize for.

Our results are compatible with several possibilities regarding what children think make a game fun to play. Looking at win-relevant variables, our results are consistent with children optimizing for ease, efficiency, and achievement when playing to win and relaxing that optimization when playing for fun. Alternatively, children may have an intrinsic desire for challenge, which is reduced in some contexts (e.g., competition or performance-based rewards; Heyman & Dweck, 1992). When adults engage in playlike activities, challenge strongly predicts task enjoyment, even more so than skill (Abuhamdeh & Csikszentmihalyi, 2012), so it seems likely to us that children are challenge-seeking in some way when playing for fun. This has important implications for education, as it suggests that joyful learning contexts tapping into children's playful attitudes may encourage greater persistence or seeking out of challenges, compared to the use of extrinsic reinforcers such as grades.

Looking at the win-irrelevant variables, children generally chose elevated settings both when playing for fun and when playing to win. Because these variables were not related to winning in any meaningful way, children must have been intrinsically motivated to choose these settings.[2] Across experiments and conditions, children chose high levels of randomness, novelty, and autonomy, consistent with interview studies probing children's understanding of play (e.g., Wing, 1995). Playing as a different character was the only win-irrelevant variable where children generally preferred the lowest setting (i.e., to play as themselves instead of dressing up). This finding is curious because pretense is important to play in many cultures (Boyette, 2016; Carlson et al., 1998; Taylor & Carlson, 2000). Perhaps pretense is sufficiently demanding that adding it to an unfamiliar and complex task is overwhelming. It could also be that pretense adds little value to our task's salient goal of knocking down blocks, compared to other contexts where pretense is itself the core activity. Moreover, pretend play is more prevalent in younger children, especially preschoolers, and the school-aged children in this study may see the game's rules as sufficient pretense on their own (Taylor, 1999) or may have found the particular costumes too "juvenile." Whatever the case, further studies can explore additional win-irrelevant dimensions to better understand what children optimize for when playing for fun.

We also found significant Age × Condition interactions in both experiments, consistent with the idea that older children showed a stronger appreciation that win-relevant variables matter when playing to win but not when playing for fun. These developmental patterns emerged in both children's game-design decisions and in which variables they judged to be important. This result suggests that older children distinguish the two modes of play by virtue of outcomes (e.g., the likelihood of winning) and aligns with previous work showing that from ages 5 to 8, children increasingly define play by attending to the process and outcomes of an activity, over the presence of particular places and objects (e.g., Letourneau & Sobel, 2020). We also found a weak correlation between age and difficulty preferences, suggesting potential developmental changes in how children estimate and weigh task difficulty during play. Further examining such developmental changes in game-design decisions may inform how children learn to reason about task difficulty in general, especially in novel tasks where the relations between environment variables, player skills, and the likelihood of different outcomes can be more opaque or complex.

Play comprises an extraordinarily open-ended class of behaviors, and game design is only one aspect of children's play. Nonetheless, other research has documented rich examples of children sharing, modifying, and inventing games, suggesting that game design is an ecologically valid task. For example, playground games often evolve as they spread across time and space (Opie & Opie, 1969). Children as young as age 7 can also design games around specific themes or invent rules that enforce appropriate social behaviors such as fair play (Castle, 1998). Thus, systematically charting how children iterate on games offer a promising window into the development of innovation, social reasoning, and other important skills.

Our game-design methodology could also be extended to study children's ability to design activities under other motivations such as playing to learn. While children initially associate learning with particular objects and situations, by age 8 children come to conceptualize learning as a process by which knowledge is acquired and are able to describe activities where play and learning co-occur (Letourneau & Sobel, 2020). Research on children's intuitive pedagogy points to an early-developing ability to select informative examples by reasoning about what others know (e.g., Bass et al., 2021), which might support children's ability to select or create informative learning activities.

The present experiments offer insight into children's judgments of fun but did not explicitly assess children's opinions of how much fun each feature setting might be and intentionally did not measure children's experience of fun. People necessarily make decisions based on what they think will happen, rather than based on what actually does happen. However, predictions, momentary experiences, and retrospective evaluations may not always align (e.g., Fredrickson & Kahneman, 1993; Kahneman, 2000). Future work might assess how accurately children can predict how much they will enjoy different tasks and how task-specific experience shapes these expectations. Children's challenge-seeking for fun might also be affected by individual differences such as persistence (Leonard et al., 2021; J. Wang & Bonawitz, 2023), grit (Duckworth et al., 2007), mindset (Dweck, 2006), or social context (Bass et al., 2021).

While we have focused here on the impact of motivation on task modification, these are not the only factors driving decision making during play. Among other things, people must balance ends and means to create and select tasks that they can accomplish, while also seeking means that make it possible to accomplish valuable goals. These interactions pose a challenging learning problem. While recent work has begun exploring how adults discover novel and interesting tasks (Davidson, Todd, Colas, et al., 2025; Davidson, Todd, Togelius, et al., 2025), it remains an open problem in development. In particular, we do not know how children learn about the space of possible tasks they could pursue, which tasks are most appropriate to satisfy a particular intrinsic motivation, or how to assess the expected difficulty or reward of any given task.

We speculate, however, that learning to flexibly reason about different tasks is deeply related to play. In particular, children in Experiment 2 reliably chose harder than baseline settings for all

[2] Children could be responding to a shared set of background extrinsic motivations, such as a belief that responding in a certain way might lead to praise. Given the relative diversity of children's potential expectations of experimenters and caretakers, however, it seems more likely to us that these results reflect intrinsic motivation.

variables when playing for fun. While play has been notoriously difficult to define and explain (Chu & Schulz, 2020; Rubin et al., 1983; Zosh et al., 2018), its challenge-seeking orientation—the willingness to relax commitments to ease, efficiency, and achievement—may help children learn the complex relationships involved in effective decision making. For example, play may be primarily about proposing goals and pursuing them to learn about the structure of problems and their solutions (Chu & Schulz, 2024). If so, children may pursue goals with a problem-directed curiosity, focused on exploring what kinds of problems can be posed and how they can be solved. In this case, challenge-seeking may be a particularly easy method for devising new goals. Alternatively, children at play may express competence-directed curiosity, placing more emphasis on learning about their own abilities than about the structure of the environment (White, 1959). In this case, challenge-seeking may be a particularly efficient way for children to learn and extend the limits of their competence. Similarly, play may optimize for empowerment gain.[3] Empowerment (Klyubin et al., 2005; Salge et al., 2014) and related measures (Liljeholm, 2018) assess how well the effects of an agent's actions can be predicted from the actions themselves; empowerment gain measures improvements in an agent's ability to control the world through their actions. In this case, children might seek challenges to improve their ability to control the world. These alternatives are neither exhaustive nor mutually exclusive; play may instead be better formulated in terms of other frameworks such as predictive processing (Andersen et al., 2023), pursuing novelty (Stanley & Lehman, 2015; R. Wang et al., 2020), or exploring rare action–state combinations (Ramírez-Ruiz et al., 2024). Future studies can explore all these hypotheses using the approach we took here. Asking children to make choices about tasks along dimensions separating these hypotheses, perhaps with a revised version of the paradigm used here, would both test various theories of play in a fine-grained way and illuminate how play relates to decision making more broadly. More generally, because our paradigm can be adapted to offer choices along a wide variety of dimensions, it offers a well-controlled and adaptable window into how intrinsic motivations—typically opaque—affect everyday decision making.

Many experiments in developmental psychology are framed as games for children to play. If play draws on specific intrinsic motivations that affect how children make decisions, having a detailed understanding of those effects will help experimenters to both interpret their results and to design experiments that take those effects into account. Similarly, guided play—which combines children's impulses toward free play with scaffolding toward specific learning goals—has emerged in educational psychology as a powerful learning tool (Weisberg et al., 2013, 2016). Better understanding how the intrinsic motivations behind play affect decision making could make guided play an even more effective tool for educators (Skene et al., 2022; Zosh et al., 2018).

Our work is one step toward understanding the complex dynamics of human decision making, especially in the context of play. Many issues remain open, such as how people navigate a much more complex set of motivations than those explored here, or how the space of possible ways to play is structured. To answer these questions, we need to study decision making using a broader range of possible motivations and goals. Doing so is challenging but will enable a better understanding of human action and of intelligent behavior. In other words, science can be hard, but it is possible both to win and to have fun doing it.

[3] Computational models of flow also rely on empowerment (Melnikoff et al., 2022), though the emphasis is less on gains in empowerment and more on preexisting empowerment. These two proposals are perhaps complementary and compatible with recent theories of human life history (Gopnik, 2020): Early gains in empowerment from play, or learning to identify opportunities for empowerment gain in play, may increase opportunities for flow later in life.

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