

## Power Dynamics in an Experimental Game

Felicia Pratto · Adam R. Pearson · I-Ching Lee ·  
Tamar Saguy

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**Abstract** We introduce a new experimental method for studying power. Drawing from multiple theoretical perspectives, we conceptualize power as relational and structural, as well as comprised of different forms through which basic human needs can be met. Thus, the method we introduce examines how, when faced with a particular need, people use multiple forms of power concurrently and within a “field of influence,” namely, the other players in a game. This enabled us to examine how one form of power is transformed into another and how power is transferred from one player to another through interaction, as well as to measure power as behavior, as the exercise of choice, as potential, and as outcomes. Two experiments using egalitarian start conditions and a survivable ecology demonstrated that participants used power to gain more power, creating inequality. Being the target of force made some players unable to “survive” in the local ecology. Theoretical and methodological issues in the study of power are discussed and the application of our game method to the study of power in other fields is considered.

**Keywords** Power · Group dynamics · Inequality · Experimental games

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F. Pratto (✉) · T. Saguy  
Department of Psychology, University of Connecticut, 406 Babbidge Road, Storrs, CT 06269-1020,  
USA  
e-mail: felicia.pratto@uconn.edu

T. Saguy  
e-mail: tamar.saguy@uconn.edu

A. R. Pearson  
Department of Psychology, Yale University, New Haven, CT, USA  
e-mail: Adam.r.pearson@gmail.com

I.-C. Lee  
Department of Psychology, National Cheng-Chi University, 64 Zhi-nan Rd. Sec. 2, Taipei 116,  
Taiwan

## Power Dynamics in an Experimental Game

Power has many forms.... No one of these can be regarded as subordinate to any other, and there is no one form from which others are derivative. ...Power, like energy, must be regarded as continually passing from one of its forms into any other, and it should be the business of social science to seek the laws of such transformations.—Bertrand Russell, 1938, pp. 9–10

Power is arguably the central topic of social science (e.g., Russell, 1938). The general nature of power makes it useful for describing social relationships at all levels social psychology addresses: interpersonal, person to group, intergroup, and societal. Studying power empirically, however, presents major challenges not only because power takes many forms, such as resource control (Marx & Engels, 1846), legitimacy (e.g., Jackman, 2001; Parsons, 1954), force (e.g., Keegan, 1993), and asymmetry in relationship obligations (Pratto & Walker, 2001, 2004), but also because power is *dynamic* and *potential* in nature. In the present article, we adopt an integrated framework for understanding the dynamics of power and its operation in multi-party systems, drawing from multiple theoretical perspectives. We first delineate what we view as several important insights about power as a dynamic phenomenon, and then introduce a new experimental method for examining power dynamics in the laboratory that is derived from our integrated perspective. Two experiments test whether people use particular forms of power to acquire other forms of power, producing inequality. We conclude by considering the utility of this method for testing dynamic theories of social power.

### Understandings of Power

#### *Ecological Approach to Power*

People do not all have the same means of obtaining what they require or of fulfilling their desires (e.g., Goode, 1972). This is why the study of power is essential to understanding inequality. More powerful individuals and groups are commonly understood to have more wealth or ability to acquire it (e.g., Engels, 1884/1902; Marx & Engels, 1846), more social status, prestige, or legitimacy (e.g., Domhoff, 1990; Jackman, 2001; Parsons, 1954), and more ability to exert force (e.g., Jackman, 2001; Keegan, 1993; Mosca, 1896/1939) than others have. Conversely, the most powerless may be destitute, de-legitimized, and lack the ability to defend themselves against violence or exploitation. A party's power, then, pertains directly to how privileged, and secure, or how marginalized, and tenuous its existence is. Fundamentally, then, power can be understood as what enables one's needs and desires to be fulfilled.

Understanding how power enables needs and desires (i.e., wants) to be fulfilled requires considering means of meeting wants both inside and outside the party in question. Hence, we call this view an *ecological* approach because it focuses on people's wants in relation to their environments. The ecological view suggests that power must be gauged both with respect to what people's wants are *and* how well

their capacities and environment (including its natural, political, and social aspects) afford the means of meeting those wants from moment to moment. In keeping with the ecological approach, the method we developed for studying power creates different needs for the players of a game at different points in time, and allows for examining how the players use their environment, which includes other players and a pool of resources, to meet those needs.

### *Power as Freedom of Choice*

By focusing on transmission between the environment and the party in question, the ecological approach is compatible with field theory, which holds that power must be described with reference to a given social field (Lewin, 1951). Rather than assume that wants control behavior, that is, that fundamental drives or motivations determine behavior, Lewin (1951) assumed that people have choices to make, but that choices are constrained by their power and the anticipated reactions of others within the same field of influence. Thus, power among parties is determined by their current states, actions, and possible futures. This implies that power can be exercised, and can influence outcomes, but can also be defined as the *potential* to influence others (Lewin, 1951, p. 40). Our method provides participants considerable freedom of choice over how to behave and what form of power to exercise. Our method also allows us to measure potential power, the exercise of power in behavior, and consequences of power (e.g., inequality).

People can employ a variety of tactics to try to influence others by getting others to anticipate certain reactions to their possible actions, for example, to threaten force (e.g., Goode, 1972), to reward, to punish, to offer affiliation, and to share expertise (e.g., French & Raven, 1959; for a more comprehensive review of influence tactics, see Fiske & Berdahl, 2007). Hence, more powerful parties have more freedom to choose their behavior than less powerful parties (e.g., Keltner, Gruenfeld, & Anderson, 2003). Considering freedom of choice as a mark of high power explains why using force is a very high power behavior. An actor who uses absolute force need not care about the anticipated reactions of the target (although the actor might care about reactions of other audiences, see Goode, 1972). Whereas with *potential* force (e.g., as exists with the mere possession of weapons) and the overt *threat* of force, an actor has need of anticipating reactions of targets because they still may exercise choice (e.g., resistance, compliance), and with *measured* (less than total) force, reactions of the victim (e.g., retaliation, calling for revenge) must also be considered, the use of *absolute* force realizes its end regardless of the victim's actions, cooperation, or consent (Zelditch, 1992). Our method operationalized all four levels of force (potential, threat, measured exercise, and absolute force).

Field theory gave rise to the conception that power arises from transferable resources (Cartwright, 1959). That is, the potential for influence within social fields is contingent on the possibility of transferring a desired good from one party to another to accomplish different ends. Such a conception holds for intergroup relations as well as for interpersonal ones. For example, in analyzing U.S. race relations, Wilson (1973, p. 17) assumed that [power] “resources should be considered in terms of their liquidity, that is, the extent to which they can be

deployed or mobilized to exert influence.” Unlike economic exchange, whereby one good must be sacrificed to obtain another (e.g., labor for food), field theoretical approaches to power assume that power can sometimes be gained without sacrifice. The ease with which one form of power can be used to gain another form is its *fungibility*. The method we introduce for studying power allows for testing the degree to which certain forms of power are being used to gain other forms through interactions, and the consequences of this dynamic process.

### *Relational Power*

The dynamic perspective of field theory was elaborated in interdependence theory, which describes power as the ability to influence the outcomes of others (Thibaut & Kelly, 1959, p. 101). Interdependence theory emphasizes power in relation to others rather than in relation to requirements (see Fiske & Berdahl, 2007). But similar to the ecological perspective, interdependence theory analyzes power as a function of how much each party can or cannot have its wants met within and outside of that relationship (see Kelley et al., 2003 and Rusbult & van Lange, 1998 for overviews). For example, Rusbult (1983) found that young adults’ commitment to their romantic relationships was a function of being satisfied within them, perceiving alternatives to their relationships to be poor, and being unable to recoup their investments in their relationships. Rusbult and Martz (1995) found that a major reason battered women stay in abusive relationships is that they depend on their partners for resources like income and transportation due to their own low education levels and unemployment. These studies show that people may choose relationships that satisfy their wants, but that deficits outside the relationship (e.g., poor employment opportunities) can trap people in harmful relationships. Conversely, if people are free to exit unsatisfactory relationships, they need not endure them. Such freedom can affect whether the relationship endures. For example, van Vugt, Jepson, Hart, and deCremer (2004) found that groups will be unstable when people can exit groups in which they dislike the leader’s leadership style. Interdependence theory assumes, then, that the stability or instability of any particular dyadic relationship hinges on the stability of alternative means of meeting wants. However, the abstract nature of interdependence theory has not required that it specify particular needs or forms of power (Rusbult & van Lange, 1998).

### *Structural Power*

In contrast to studies of dyadic relationships and group dynamics, societal studies of power have examined dynamism over much longer periods (e.g., the rise and fall of certain rulers, forms of government, institutions, or empires). Such studies have focused on structural relationships that tend to stabilize societies. These approaches generally hold that power structures recurrent social relationships (e.g., Parsons, 1954), and that power tends to be enacted in four basic forms: wealth, prestige, force, and social affiliation (e.g., Goode, 1972). That is, one can describe recurrent relationships that structure societies with reference to specific recurrent forms of power.

Societies with economic surplus have three kinds of recurrent structural power relationships: one based on the adult–child distinction, one delineated by some arbitrary social distinction such as race, ethnicity, religion, nationality, or class, and one associated with gender (Sidanius & Pratto, 1999; van den Berghe, 1967). Dominants in all three kinds of relations (i.e., adults, arbitrary-set dominants such as Whites in the United States, and men) generally have more wealth or control over desirable resources, more prestige and legitimacy, more advantage in using force, and more advantage in affiliative relationships than subordinates in all three kinds of relations (see Pratto & Walker, 2004). However, there are also differences among the kinds of relationships in terms of how much each form of power characterizes the relationship and in how volatile the relationships are. Of these three, gender relations show the least plasticity in terms of who is defined as playing the dominant and subordinate roles, the most constancy over historical time and across societies, whereas arbitrary-set intergroup relations are the most volatile, the most violent, and the most lethal (see Pratto, Sidanius, & Levin, 2006). In examining how gendered power intersects with arbitrary-set and adult–child distinctions, Pratto and Walker (2004) theorized that the amount of stability (or volatility) of each relation depends on how fungible each form of power is. Forms of power that men try to control, such as legitimacy, force, and resources, are generally volatile because they are easily contested, can be easily converted from one form to another, and can be fairly easily transferred from one party to another. In contrast, the care-taking that women often provide to others is not as fungible because it is a *personal* resource. When no other person will do, a woman's obligations are not fungible and thus constrain her power. The stability or volatility and lethality of these kinds of structural relations may be described by the fungibility of the four recurrent forms of power.

The structural perspective on power, then, emphasizes three insights that informed the present work. First, that four particular forms of power—(1) wealth or control of exchangeable resources, (2) status, prestige, or social legitimacy, (3) force and violence, and (4) affiliation or obligations to other—describe recurrent structural relations. Second, as suggested by Bertrand Russell (1938) in his analysis of social power, power dynamics should be analyzed by considering multiple forms of power simultaneously. The causes and consequences of the U.S. civil war, for example, cannot be adequately described only with reference to wealth differentials between North and South, or to the legitimacy of particular leaders and social practices (federalism, slavery), or to force on the battlefield and in slavery, or to obligations to family, nation, and slave-owner. Rather, multiple forms of power and their interplay make a useful way of analyzing complex, multi-party, dynamic interactions. Third, the stability or volatility of power dynamics may be due to how fungible particular forms of power are with one another. So long as parties who possess one form of power can use it to gain other forms of power without substantial sacrifice, those who are high on power are more likely to remain so.

### The Crux of Power Dynamics: Needs, Forms, and Fungibility

Combining insights from the ecological, freedom of choice, relational, and structural understandings of power, we posit that the reason particular forms of

power tend to recur is that they address recurrent requirements for survival and well-being. Such ecological needs must be met by using a corresponding form of power. When a form of power (e.g., legitimacy, violence) cannot be directly used to meet one's particular need (e.g., to eat), it can be used to meet a need by transferring the need to someone else (e.g., asking for food) or by transforming it into another form of power (e.g., threatening harm to gain food). Commonality of needs among people in a sphere of influence enables people to use relationships with others to transfer power from one form to another to meet their needs. People's willingness to engage in transactions that transfer power from one form to another and from one party to another is what makes different forms of power fungible. The fungibility among forms of power and the degree parties will interact with one another determines how stable or unstable and how equal or unequal relations among parties become. In short, to understand the dynamism of power relations, one needs to understand the parties' requirements, the potential power they and others in their sphere of influence have, how fungible each form of power is with other forms, and the history of the parties' interactions.

### Researching Power Dynamics

These theoretical perspectives offer several insights into how power may be productively examined. First, because people make choices that are constrained but not determined, power should be studied by putting people in situations that constrain but do not dictate how they can behave. Second, the exercise of power should be considered in relation to requirements for survival. This implies that power should be examined in comparison to some ecological state, such as whether there are enough resources to ensure survival, and the ease of using the various forms of power to meet these survival requirements. Third, power entails dynamic actions among several actors over time. This implies that power must be examined within spheres of influence, that is, among recognizable sets of actors. Fourth, the conception of power as the *potential* for influence or the *ability* to influence implies that power cannot be measured simply by observing the exercise of power or consequences of behavior. Thus, a means of measuring power as potential is required. Fifth, there are several kinds of power which are fungible but not equivalent, and they are often in play simultaneously. For example, in deciding whether to use force, a party could consider whether it has the wealth to recoup possible losses if force is or is not used, how the party's status will be affected, and whether the party has obligations that will be realized or reneged upon if force is used. This implies that researchers must measure several kinds of potential power and how possession of one potential influences possession of future potentials. Finally, the fungibility of kinds of power as determined jointly by the parties should be observed.

Methods of examining power in this degree of complexity are rare. Experimental studies have traditionally examined the exercise of one form of power by one actor in one direction (e.g., a prospective employer or member of dominant group behaves toward another), with behavioral responses documented in a subsequent study (e.g., Operario & Fiske, 2001; Woodzicka & LaFrance, 2001; Word, Zanna, &

Cooper, 1974). Although such methods establish that a causal chain could exist, they do not afford examining the sequential histories of repeated actions and interactions that characterize power dynamics. Computer simulations are beginning to simulate such chains of action, and are sometimes compared with aggregate behavioral data from laboratory and field studies (e.g., Gottman, Swanson, & Swanson, 2002; Kenrick, Li, & Butner, 2003). Historical and archival studies of real individuals, groups, and societies may be appropriate, but also may be quite expensive and encounter substantial missing data. In addition, they typically do not afford the degree of experimental control that allows one to draw determinative conclusions about how ecological conditions (e.g., the availability of resources) and nature of fungibility influence the use of power and its effects.

Studying power presents practical and ethical issues as well. As power speaks to requirements for survival and well-being, the exercise of power can harm and endanger people. The importance of such consequences prioritizes the need to study harmful uses of power, but ethical considerations necessitate that power be studied in ways that do not induce actual harm. For these reasons, experimental games have been developed that allow researchers to specify the environmental conditions, the needs and possibilities, and sometimes goals of participants, and allow the measure of consequences of sequences of actions while still offering players some freedom about how to behave. Game theory experiments and simulations have examined 2- and n-person games in which behavioral options are highly constrained, such as choosing either to “cooperate” or “compete” (see Coleman, 1982 and Rapoport, 1966 for overviews). Although simple games have enabled the study of a range of important social behaviors (e.g., Axelrod, 1984; Caporael, Dawes, Orbel, & van de Kragt, 1989; Deutsch & Krauss, 1960; Tjosvold, 1981), the forms of power in such games and the repertoire of possible behaviors are often very limited. In addition, available experimental paradigms for measuring aggression and coercion typically do not accommodate multiple acts performed by multiple parties over time.

### Rationale and Features of the Game Method

To address these issues, we developed an experimental game to allow us to observe theoretically important aspects of power. The method enables one to observe how people use various forms of power and respond to and anticipate their use by others. In addition, the method allows us to observe outcomes for individuals and groups that are a joint product of individuals’ ecological needs, behavior, and that of those in their sphere of influence. Operationalizing different forms of power in a game produced some constraints and necessitated certain simplifying assumptions. Aspects of everyday life and our theory of power fungibility were represented in the game as follows.

Because we assumed that particular forms of power can be represented by what requirements they enable one to meet, rather than by their labels, we never told participants we were studying power (until debriefing) and each form of power was represented only abstractly by a particular color of token. Events in the game established each players’ requirements for “survival,” and rules governing how each color token could be used and what consequences possessing that token could

or would have communicated the affordances each form of power had regarding those requirements.

The other players in the session represented parties within one's sphere of influence; all other hypothetical actors and available power were represented by a pool of colored tokens. The pool prevented the game from being closed and zero-sum. Enacting Lewin's (1951) view of power as constrained choice, on each turn a player could make free choices, constrained but not determined by rules about each type of power (color token) the player possessed. Following this, a player responded to an event card that suggested or required actions by the player(s). For example, an event card might require the player to obtain an obligation token from another player or to give resource tokens to the pool, but the player could determine *how* to obtain the necessary tokens by interacting with other players or the pool.

Because survival is arguably the most primary and consensual goal in life, the object of the game was to remain in the game (hence, we told participants it was called the "In Game"). To survive, one must have some minimal amount of resources. This was represented by events that required players to have a minimal number of resource tokens to remain in the game. Living requires the regular consumption of resources and receiving care from other people. Both of these were represented by events in the game which were frequent but not regular enough to be predictable, mimicking the nature of uncertainty in real life. Players also had the option of using measured force against other players, in which the target had some choice over how to respond, or using absolute force against other players, in which all the targets' power was taken by the actor.

The purpose of the present research was to test fundamental consequences of our integrated approach to power bases and fungibility. First, we wished to validate the In Game as a method for studying power dynamics. We would consider the method valid if participants could play the game, which we would see as evidence (1) that they have knowledge about forms of power from prior experience, (2) that they exercised choice in the game in ways that influenced themselves and other players, and (3) that they could distinguish among the forms of power we intended to instantiate. Second, we tested for evidence of fungibility. In particular, although the starting conditions and events of the game provided for egalitarian conditions among players and did not necessitate the further acquisition of power, we expected participants to use power to gain power, such that both individual players and particular sessions of the game that acquired more power in one form would tend to also acquire more power in other forms. Third, because the use of force restricts others' options the most, it is the most direct way of disempowering another. Thus, we predicted that uses of force would be related to increased power imbalances among players and to decreased "survival" rates.

The present research focuses on four forms of power that have been shown to be recurrent in intergroup and interpersonal relationships: resources, force, legitimacy, and asymmetric obligations (Goode, 1972; Pratto & Walker, 2004). As some of our theorizing about forms of power was derived from research on gendered power (see Pratto & Walker, 2004, for a review), we also examined whether player's gender influenced the game outcomes reported here.



## Study 1: Introducing the In Game

### Method

#### *Participants*

Participants were undergraduates who participated in exchange for partial credit or extra credit in introductory psychology courses. Twenty sessions of the experiment were conducted; 18 with five players and 2 with four players (because the fifth participant did not arrive). All sessions were mixed gender except for two all-male sessions and one all-female session. In total, 51 women and 47 men participated.

#### *Procedure*

Participants arrived at the laboratory in groups and were seated at a table in the middle of the room. Each participant was randomly assigned to a unique player letter. The main experimenter informed participants that they would be playing a new game together for about an hour, and then would answer questions about the game. The recording experimenter observed the game unobtrusively and recorded the actions performed by players throughout the course of the game.

The main experimenter explained that the object of the game was to stay in the game and demonstrated the rules. Each player was initially allocated one token of each color (blue, red, green, and yellow) and was given a rule card explaining what players could do with each color. Each player's tokens remained visible to all other players. Play proceeded by each player turning over an event card from the stack, reading it aloud, and responding to it. Players took turns in the order of their alphabetical identifier and played for 10 turns each through the course of the session. Extra event cards at the bottom of the stack ensured that players could not anticipate their last turns. The main experimenter answered questions about the rules as necessary and served as the “banker” for the pool of extra tokens. Experimenters were instructed not to comment on the play during the game. Games typically lasted about 50 min.

#### Design of the Game

The events instantiated needs in that the events stated when players were required to have resources, obligations, and force and how much of each form of power was required. The rules governing use of tokens established the ease with which forms of power could meet needs. In those senses the game reflects the ecological view of power described above.

The reader should keep in mind that no such terms were used to describe the game or rules to the participants. That is, experimenters never labeled each color token as a particular type of power (e.g., force). In addition, experimenters used a restricted set of neutral verbs to describe the potential actions of players (“get, trade, give”), avoiding the use of terms indicative of power forms such as “steal, threaten, attack, buy, sell, pay, tax.” Table 1 lists the forms of power and explains how they

**Table 1** Forms of power and how they were instantiated and measured in the In Game

Form of power	Instantiation in game	Measure
Resources	Players were intermittently given and intermittently required to give green tokens to pool Possessing fewer than minimum resource tokens at certain events forced player to be eliminated	No. of green tokens
Force	Slightly greater quantities of force tokens than another player meant a player could receive one token from another player Substantially greater quantities of force tokens meant a player could take all of other players' tokens	No. of red tokens
Legitimacy	Received or removed by consensus votes of other players	No. of blue tokens
Obligation	Occasional events required a player to have another player's obligation token Exchanges of obligation tokens implied players had joint obligations concerning resources	No. of other player's yellow tokens held – No. of own yellow tokens others hold

were operationalized and measured in the game. Details are described below. Four types of power tokens were distinguished by their colors, in which green tokens represented resources, red represented force, yellow represented obligation, and blue represented legitimacy.

#### *Conditions and Information Availability*

Every player began with one of each color token and tokens remained in full view of all players during the game. Each player had a rule card in hand and could ask the experimenter questions at any point. Events ensured that all players could survive the game if they initiated no actions and all players were offered the same number of explicit choices throughout the game.

#### *Green (Resource) Tokens and Related Events*

Occasional but unpatterned event cards required the pool to allocate (or take) resource tokens to (from) a designated player or to (from) all players. Certain event cards required any player with fewer than a minimum number of resource tokens to be eliminated from the game, and participants were made aware of this requirement prior to the start of their session. In this way, the game instantiated the intermittent but inescapable need of resources to survive.

#### *Red (Force) Tokens and Related Events*

Players could exchange several resource tokens for a red force token with the pool at a fixed rate, or vice versa, representing the fact that resources can be used to gain a means of force and vice versa. On a player's turn, a player with one or more force

tokens than another player had could choose to “show” that force token to another player (using measured force), allowing him/her to request a minimal number of tokens from that other player. The victim could decide how many and which color of tokens to offer, barring legitimacy tokens, but was required to give at least one token to the player who showed a force token. This rule instantiates measured force in which the target’s behavior is partially, but not totally, constrained to the benefit of the actor. In other words, when one player had one more force token than another player, that player had *potential* force, but choosing to “show” the force token represented the exercise of measured power. A player with three or more red force tokens than another player could “use” red force tokens (absolute force) to take *all* of the victim player’s force, resource, and obligatory power (indebtedness) tokens. Such an action represents the use of absolute force to impoverish another party and leave that party without allies or defenses.

### *Blue (Legitimacy) Tokens and Related Events*

Players could receive an additional legitimacy token or have that token removed if any player nominated that player and a majority of players voted in agreement. Both of these voting procedures represented the notion that legitimacy is a matter of consensual but not necessarily unanimous social approval. Further, players who acquired high numbers of resource and force tokens could have another legitimacy token from the pool upon request, to represent the notion that people and groups with many resources and options for the use of force often gain legitimacy. Some events required players with few legitimacy tokens to give resource tokens to players holding many legitimacy tokens. These events represent situations in which lower status individuals aid higher status individuals such as paying tribute or fans buying the products of celebrities. Other events required players with several legitimacy tokens to give the other players resource tokens. These represent cases in which more legitimate or high status people or groups share some wealth with others, as in the case of noblesse oblige or named charitable contributions.

### *Yellow (Obligatory Advantage/Indebtedness) Tokens and Related Events*

Yellow tokens (indicating one’s obligation to another) were the only ones that were personalized; they had each player’s identifying letter on them. At the outset, the experimenter explained that occasional events would require that a player had someone else’s yellow token in hand. Such events represent the fact that people sometimes need the help or care of others. Players could negotiate (e.g., request, borrow, or trade) for another player’s yellow token when an event required it, or could do so ahead of time. Participants were informed that if they held another player’s yellow token, that player was then obligated to provide resources (green tokens) to the participants on every turn. Because long-term mutual obligations require maintenance resources (e.g., spending time with friends) and often involve joint obligations to others (e.g., parents are obliged to provide for their children), players who had exchanged yellow tokens with each other were intermittently required to share resources with each other and were jointly obliged to give resource

tokens to the pool. Asymmetric obligations could then be measured by the difference between how many of other players' tokens a player possessed (representing the amount of commitments others owed that player) versus the number of one's own tokens held by other players (representing the amount of commitment one owed other players).

## Measures

### *Power and Its Use*

The amount of potential power a player had on each turn of the game was represented by the number of each color token the player possessed. The recording experimenter recorded all players' actions during the game dyadically (e.g., the action, actor, and target), including the number and color of tokens moved, and whether (and when) players were eliminated from the game due to insufficient resource tokens. In this article, we focus on the distribution of forms of power among players at the end of the game and on players' use of force during the game.

### *Validation of Power Tokens*

At the end of the game, we asked participants to write up to two analogies from "real life" to particular events from the game and for each color of token. Our coding guide provided an abstract definition of a correct answer for each event and token and examples of each. In addition to counting answers we considered to be strictly correct, we counted answers that were plausibly correct. Typically, these provided only part of the information that a correct answer had or reversed the parties in an interaction. For example, the definition of a correct answer for "show red tokens to another player" was "Any sort of coercion or threat: Some power you hold that can influence others to do what you want or give you something. Using a resource you have to get another resource but without giving up the resource you started with." Participants' answers we coded as matching these criteria were "Threat to get what you want" and "Showing a cop's badge." "Stealing money" was a plausibly correct answer because it included part of the criteria (getting a resource). Two coders averaged 82% agreement with one another classifying responses as strictly correct and over 96% agreement on classifying responses as plausible or correct across events.

## Predictions

This article examines the psychology and dynamics of power as enacted in the experimental game in several ways. First, we assumed that adults have at least implicit knowledge about various forms of power that they would be able to analogize the abstract representations of power in the game to ordinary life. We predicted high conceptual validity in the analogies players made to the tokens and actions of the game. Second, we expected power to be exercised as choices over behavior. We predicted that players' actions would influence the outcomes of those

in their sphere of influence. In particular, we tested whether the actual game results, including distribution of forms of power and elimination from or “survival” in the game, differed from hypothetical results dictated only by the event cards and starting conditions. Further, we tested whether players were eliminated from the game as a function of particular actions taken in their sphere of influence (game session). Third, we tested whether players’ actions made each form of power fungible with the others. If players use one form of power to accumulate other forms of power, then the amount of power of each form they accumulate should correlate positively with each other form of power. In contrast, if one form of power must be traded off to gain another form, the two forms should correlate negatively. Because we view various forms of power as generally fungible, we predicted that there would be positive correlations among the forms of power. The accumulation of power by certain players but not others will produce inequality among players. Even though the In Game was not a zero-sum game, we predicted that survival is more certain in egalitarian contexts, so we expected inequality to increase the chance that players would be eliminated from the game. Finally, because force often dramatically redistributes power among parties, we tested whether the use of force would increase inequality and the chance players would be eliminated from the game.

## Results

### *Conceptual Validity*

For the analogies to colored tokens and game events that participants wrote, data from the primary coder and examples of participants’ correct responses for each event are shown in Table 2. As Table 2 shows, nearly all participants could provide real-life analogies for each token or event and on the whole their answers were appropriate. Each participant tended to describe forms of power as used by individuals (e.g., roommates, muggers), institutions (e.g., the bank, the army), and collectives (e.g., nations), demonstrating that the forms of power we describe are pertinent to a variety of kinds of relationships and can be exercised by both individuals and groups.

### *Consequences of Behavioral Choices*

We provide two kinds of evidence that participants made choices about the use of power to influence their outcomes and those of the others in their session. First, to illustrate how players’ choices helped determine consequences within their sphere of influence, we briefly describe three sessions that had extreme final outcomes for at least one form of power. That is, the sessions we describe had either the highest mean, the lowest mean, or the lowest standard deviation of at least one color of token of all the sessions. Differences between sessions demonstrate that the actions participants chose determined behavioral outcomes. Second, we compare the actual results of the sessions, with regard to accumulated power tokens and game survival, to the outcomes that are strictly determined by the event cards and initial starting

**Table 2** Game events, proportion of participants who provided at least one analogy for each event, proportion of answers which were correct or plausible, and example answers, Study 1

Events as described to participants	% who answered	% correct	% plausible or correct	Example correct responses
<i>Events concerning resources</i>				
Pay green tokens to pool	93	83	97	Buying groceries. Paying taxes. Paying rent
Receiving green tokens from pool	93	87	99	Getting allowance. Receiving a paycheck
Exiting the game because player has fewer than minimum	93	56	96	Death. Bankruptcy
<i>Events concerning force</i>				
Show red tokens to another player	93	43	72	Blackmail. Forcing someone to give you money
Use a red token to take another player's tokens	92	48	96	War—whoever has power takes away things
Pay 1 green token to pool for every 10 red tokens you have	93	71	96	Taxes on your weapons
<i>Events concerning legitimacy</i>				
Having players vote to give a player a blue token	95	70	94	Voting in an election, nominating someone for an award
Voting to remove a blue token from a player	89	75	95	Punishing someone for corruption. Voting to impeach the governor
All players paying green tokens to players with more blue tokens	93	46	97	Paying taxes to "king." Poor paying taxes to the rich. Rich get richer, poor get poorer
Players with many blue tokens paying green tokens to other players	93	55	91	Giving money to the needy. Rich people paying higher taxes
Giving away all your tokens to other players and receiving a blue token	85	60	95	Attempting to gain respect and wealth by being generous
<i>Events concerning obligations</i>				
Needing another player's yellow token	90	70	91	Need the help of a friend. Asking for favors
Exchanging yellow tokens with another player	90	76	97	Partnership. Alliances. Forming ties with another person so you can help each other in the future

**Table 2** continued

Events as described to participants	% who answered	% correct	% plausible or correct	Example correct responses
Two players jointly paying green tokens to pool	91	61	93	Married couples paying taxes. Roommates paying rent. Splitting a restaurant bill
Mean across all events	92	64	94	

*Note:* The percent who wrote some answer to the question of what the event is analogous to in real life is shown. The percent correct by our strict criteria for each question is the percent of those who answered correctly. The percent correct or plausible is the proportion of those answered who either met our strict criteria or who gave a plausible answer. Often plausible answers lacked details necessary for correct ones but were not inconsistent with or fundamentally different than our correct criteria. Participants' answers are verbatim. Separate answers are separated by periods

conditions (i.e., assuming no free-choice, where participants only engage in behaviors necessitated by the rules).

Players in Session 19 maintained balances of power with one another chronically through indiscriminate helpfulness rather than through particular long-term obligations. Whenever an event required that a player obtain another player's token, players in Session 19 readily offered the token to the player in need, who returned it on his or her next turn. This session was the only session in which each player maintained exactly one force token throughout the game, ending with the lowest mean and standard deviation for force tokens of any session. Session 19 ended highly similar to the passive game on other measures and no players were eliminated.

Session 5 appeared to establish a norm of courtesy with relationships that were more involved than Session 19's following some initially generous and trusting actions. On her first turn, Player D gave her obligatory power token to Player C (establishing indebtedness to Player C), although this was not required by the event. On her second turn, Player D exchanged her force token for resource tokens with the pool and distributed these equally among the three other players. On Player C's next turn, he nominated Player D to receive a legitimacy token, which was unanimously approved. Player D continued to give tokens to other players and was unanimously voted legitimacy tokens twice more when she nominated herself. Players offered their obligation and force tokens to other players when needed without imposing another requirement on them, who always returned them a few turns later. No player showed or used force tokens against another player. At the end, no player had another player's obligatory power token and no players were eliminated.

Session 18 initially appeared highly interdependent and mutually respectful, followed by an extreme outbreak of uses of force. The start of the session appeared typical with favorable legitimacy votes and obligation exchanges. At one point in the session, no player would offer a force token to Player D whose event required he get one, without extracting an obligation token from him. Following one show of force, players began exchanging obligation tokens multiple times to gain legitimacy tokens. After Player D used force, no players exchanged obligations. During the remainder of the game, Player E used force to take nearly all of other players' tokens twice and then was eliminated, Player B used force three times and then was eliminated along with Player A, and Player C used force 7 times. Using force to take enough of another players' tokens to eliminate that player was sometimes given verbal approval (e.g., "That's awesome!") and sometimes regretted (e.g., "I don't want to do this, but I have to end this."). At game end, Player D had fewer than the minimum number of resource tokens to remain in the game, had the event testing for elimination occurred. Session 18 the highest mean number of force tokens (18.8), the most players who used force (4 of 5), the highest mean number of times each player used force (3 per player), and the most players eliminated (3 of 5).

The fact that players sometimes changed their patterns of behavior during the games suggests they may have been responding to current conditions as well as realizing more possibilities for power. The In Game instantiates the possible uses of power dynamically. Contrasts between the behavior patterns of these sessions demonstrate that given the same ostensible goal ("survival"), the same initial amount of each form of power, and same rules, and the same sequence of events,



participants had substantial freedom of choice, while still constrained by others and their own ecological state.

We tested for the effects of player choice by comparing the actual results of the sessions to the outcomes that would have occurred, given the event cards and initial starting conditions, if players had taken no actions. That is, assuming that players did what the events required but initiated no actions not required by the event cards, we could calculate with certainty the number of players who would remain in the hypothetical passive game and the distribution of each color token to each player. The first evidence concerns the rate of elimination. In a hypothetical passive game, the event cards enabled all players to “survive” the game. In actuality, one player was eliminated in each of four sessions, and in one session three players were eliminated. The fact that players in 25% of sessions did not have enough resources to remain in the game indicates that players’ actions redistributed resource tokens. The number of players actually eliminated (7) differed reliably from the expectation based on the hypothetical passive game,  $t(97) = 2.10$ ,  $p < .05$ . Second, we compared the number of tokens of each color players would accumulate in the hypothetical passive game against results from actual game play. As summarized in Table 1, the number of green tokens is a measure of resource power, the number of red tokens a measure of potential force power, the number of blue tokens a measure of legitimacy, and the number of obligation tokens received from other players minus the number given to others is a measure of obligatory advantage. Because the four measures of power were expected to be correlated, we set the alpha-level to .05/4 or .0125 for each test. As shown in the top panel of Table 3, the mean level of power accumulated in each session differed from the passive game for force, legitimacy, obligatory advantage, but not for resources.

**Table 3** Mean number of tokens expected in a passive game compared with actual session results with test statistics comparing them, and mean numbers of tokens for particular sessions, Studies 1 and 2

	Tokens representing type of power			
	Resources	Force	Legitimacy	Obligatory advantage
<i>Study 1</i>				
Hypothetical Passive game	24	1	1	0.2
Actual game	24.14	1.78	3.83	−0.02
<i>t</i> -test	.05	3.00	3.05	−6.18
<i>p</i> -value	.96	.007	.007	.00
<i>Study 2</i>				
Hypothetical Passive game	17.7	2.20	1	0
Actual game	11.63	2.87	2.09	0.08
<i>t</i> -test	−6.87	4.20	6.41	1.56
<i>p</i> -value	.001	.001	.001	.13

*Note:* Alpha-level for each test was set to .0125. For Study 1, number of sessions was 20 ( $df = 19$ ). For Study 2, number of sessions was 32 ( $df = 31$ ). *t*-tests compare mean across sessions with hypothetical mean from a passive game (in which players initiated no actions)

### Fungibility

The rules specified only two kinds of direct relations between forms of power: (1) A pair of players who exchanged obligation tokens received one legitimacy token from the pool (the two parties had to negotiate who received it), which implies that players with more of other's obligation tokens should have more legitimacy tokens, barring other factors. (2) Players could exchange 10 resource tokens for a force token with the pool or vice versa, which implies that players with more force tokens should have fewer resource tokens, barring other factors (such as the use of force). If other forms of power types are fungible, that is, if players can use one form of power to obtain another form of power without giving up the first form of power, then different forms of power should correlate positively over time. If pairs of power types are exchangeable, that is, players can give up one form of power to obtain another form of power, then different forms of power should correlate negatively.

We computed the correlations among the number of each color of tokens possessed by players at the end of their session. At the start of the game, there were no such correlations as there was no variance among players in the amounts of forms of power they had. The results in Table 4 demonstrate that the levels of each

**Table 4** Correlations among measures of each form of power at end of play, means and standard deviations by player, Studies 1 and 2

Form of power (color token)	Form of power			
	Legitimacy	Force	Resources	Obligatory advantage
<i>Study 1</i>				
Legitimacy (blue)	1.00	.66***	.55***	.45***
Force (red)	.66***	1.00	.59***	.55***
Resources (green)	.54***	.57***	1.00	.37***
Obligatory advantage (yellow)	.45***	.56***	.35***	1.00
Mean	1.79	3.88	24.1	-0.02
SD	1.75	9.97	19.5	0.81
<i>Study 2</i>				
Legitimacy (blue)	1.00	-.01	.22*	.28**
Force (red)	.06	1.00	.08	.43**
Resources (green)	.21*	.09	1.00	-.05
Obligatory advantage (yellow)	.32**	.47**	-.05	1.00
Mean	11.69	2.88	2.10	0.08
SD	8.63	2.39	1.21	1.83

*Note:* For Study 1,  $n = 98$ . For Study 2,  $n = 156$ . \*  $p < .05$ ; \*\*  $p < .01$ . Below the diagonal, means, standard deviations, and zero-order correlations among token levels at the end of the game (or when player was eliminated from the game). Above the diagonal, partial correlations controlling for the number of tokens each player would have received in a hypothetical passive game. Obligatory advantage is the total number of other players' yellow tokens held by the player minus the total number of the player's yellow tokens held by other players

**Table 5** Correlations among standard deviations within session in each form of power at game end, Studies 1 and 2

Kind of power	Kind of power		
	Resources	Force	Legitimacy
<i>Study 1</i>			
Force	.77***		
Legitimacy	.79***	.93***	
Obligatory advantage	.71***	.73***	.58**
<i>Study 2</i>			
Force	.55***		
Legitimacy	.36*	.23	
Obligatory advantage	.37*	.44*	.25

Note: Session is the case. For Study 1,  $df = 19$ . For Study 2,  $df = 31$ . \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$

form of power correlated positively with one another. To show that such correlations are not simply due to the events or the exchange rules, we also partialled out the number of tokens of each color each player would have received through passive play (i.e., purely dictated by the rules and events of the game). Both sets of correlations were nearly identical. As shown above the diagonal in the top panel of Table 4, the more power of any form a player had, the more of the other three forms of power the player had.

Fungibility can also be shown at the session level. The standard deviation among players within a session indexes how equal (if zero) or unequal the distribution of each form of power was at that point of the session. Using each session as a case, we correlated each session's standard deviation for each kind of power with each other standard deviation as measured at game end (see top panel of Table 5). For example, the correlation of .77 between the session standard deviations for resources and force implies that the more players in a session were unequal in resource tokens, the more they were also unequal in force tokens. Every correlation among these inequality indices (standard deviations) was high and reliable. These correlations indicate that sessions that were egalitarian in one form of power were likely to be egalitarian in other forms of power, and that sessions unequal in one form of power were likely to be unequal in other forms of power. This pattern demonstrates that choice need not lead to inequality even in a highly fungible environment.

### *Consequences of Use of Force*

Force tokens represent *potential* exercise of power, but *use of* force tokens shifts power tokens from one player to another. Repeated use of force could redistribute power tokens, and players could give tokens to other players at will. For these reasons, it is an empirical question rather than a logical consequence of the rules whether using force increases inequality over time. To test whether the exercise of

**Table 6** Average standard deviations within sessions for tokens representing each kind of power by whether force was used in the session, Studies 1 and 2

Exercise of force	Kind of power				
	Resources	Legitimacy	Force	Obligations due	Obligations owed
<i>Study 1</i>					
Force used ( $n = 8$ )	21.07	1.52	8.69	0.96	0.65
Force not used ( $n = 12$ )	11.46	0.66	0.98	0.54	0.34
Exercise of force	Kind of power				
	Resources	Legitimacy	Force	Obligatory advantage	
<i>Study 2</i>					
Force used ( $n = 16$ )	7.68	0.85	2.38	1.82	
Force not used ( $n = 16$ )	6.16	0.49	1.49	0.76	

*Note:* In both studies, there were main effects for form of power and exercise of force, but no interaction between them (see text)

force increased inequality, we subjected the standard deviations of each power measure at game end to repeated measures analysis of variance by whether force was used in the session. As expected, standard deviations were larger in sessions in which force had been used,  $F(1, 18) = 4.20, p < .05$ , partial  $\eta^2 = .17$  (see means in top panel of Table 6). There was also a main effect for form of power,  $F(4, 15) = 9.56, p < .001$ , partial  $\eta^2 = .71$  due to higher means for resource tokens, but no interaction with exercise of force,  $F(4, 15) = 1.32, p = .31$ . Use of force corresponded to greater power inequality of all four forms of power in sessions.

Recall that the game was designed to be survivable for each player if resource tokens were not redistributed unequally or reduced. A possible consequence of unequal distributions of power is that players could be eliminated due to insufficient resources. In fact, the proportion of players eliminated from each session correlated reliably with the standard deviations in legitimacy,  $r = .86$ , asymmetric obligations,  $r = .69$ , resources,  $r = .76$ , and force,  $r = .87$ , all of which held controlling for the mean level of resources,  $ps < .001$ . The high correlations among the standard deviations of all forms of power show that the probability of being eliminated was tied to all forms of power, rather than only to resources, supporting the fungible nature of power. Moreover, these results show that unequal distributions of power even in a non-scarce, non-zero-sum economy can endanger “survival.”

To directly examine whether use of force contributed to players not “surviving” the game, we examined whether each player was eliminated due to some use of force in the game. Because players in the same session were influenced by the same power context, we used mixed model analysis to estimate the contextual effect. The variance estimate indicated by the mixed model suggested that the contextual effect was negligible. Thus, we adopted stepwise logistical regression to estimate the likelihood of each player being eliminated using the following predictors: the

number of times the player used force, the number of times the player had been the target of force, and the number of times force was used in the session. Results showed that for each time that force was used against a player, the player was 1.8 times more likely to be out of the game,  $p < .01$ .

### *Player Gender*

Because part of our theorizing is derived from an analyses of the bases of gendered power, we tested whether the amount of power accumulated and the use of force were related to individual player gender and to the “gender context” in the form of the proportion of men in each session. A mixed-model analysis on whether a player used forced showed a marginal session effect,  $p = .07$ , and the same analysis on whether a player was the target of force by another player showed a session effect,  $p = .057$ , so, to be cautious, we report correlations for the sessions rather than for players. (The same results were reliable but stronger for correlations using players as the case.) The higher the proportion of male players in a session, the more red tokens were accumulated,  $r = .66$ ,  $p = .002$ , the more players used force,  $r = .70$ ,  $p = .001$ , and the more times force was used in the session,  $r = .62$ ,  $p = .004$ . Omitting Session 18, which had all male players, the highest accumulation of force tokens, and the highest frequency and proportion of use of force, these correlations were still reliable.

### Discussion

These results indicate that our experimental game does instantiate four separate forms of power in the players’ minds, and that participants made choices as to whether and how they would use each form of power, given the constraints of the game. Moreover, players’ exercise of power affected others in their “sphere of influence.” Players were able to accumulate power across forms, with the consequence that some players accumulated more power than others. Importantly, such inequalities tended to occur within a session, even though the starting conditions for each player and for each session were identical. Exercising choices redistributed power, particularly in certain sessions, and the more unequally power within a session was distributed, the more likely that players did not “survive.”

The In Game method shows that it is feasible to measure power without labeling it as such and in several forms simultaneously (as represented by different colors of tokens). Moreover, our method shows that power can be measured as *potential* influence (in terms of token quantities) separately from measuring how power is used or enacted (e.g., behaviors we recorded, such as whether players used force, were conferred legitimacy by others), expectations, and the consequences of power (e.g., inequality, survival). The method affords both freedom and constraint, just as ordinary living does, and provides ways to quantify consequences for structural relations between actors within a sphere of influence. The method also allows the observation of local effects, such as emergent behavioral norms, expectations, and social contracts, as shown here qualitatively in the narratives of different sessions.

## Study 2: Replication and Extension

Study 2 was designed to replicate the basic effects observed in Study 1 regarding the enactment of behavioral choice to produce inequality, the fungibility of these forms of power, the consequences of the use of force, and participants' understanding of the abstractly represented forms of power. To control the gender composition of the sessions and provide a more definitive test of whether gender composition influences behavioral outcomes, male and female participants were randomly assigned to play in same-gender or mixed-gender sessions. In addition, we tested whether participants could conceptually discriminate among the four forms of power by using forced-choice questions that analogized each token color to the use of different forms of power in everyday life. Finally, to test for fungibility among obligatory power and legitimacy, we eliminated the lone fungible rule that had established a direct relation between these two forms of power in Study 1 (providing players who exchanged obligation tokens with legitimacy tokens).

### Method

#### *Participants and Procedure*

Participants were 156 undergraduates who participated for partial course credit in an introductory psychology course. Due to random assignment and scheduling, there were 10 sessions with all male players, 12 sessions with all female players, and 10 sessions with both male and female players. Four sessions had four players and 28 sessions had five players.

#### *Procedure and Materials*

The procedure and materials were highly similar to Study 1. To eliminate the direct relation between obligatory power and legitimacy, players who exchanged obligation tokens did not receive a legitimacy token. Rather than allowing legitimacy tokens to increase the number of resource tokens players received from the pool, legitimacy tokens allowed players to verbally communicate with other players and to initiate actions (e.g., barter with another player or purchase force tokens from the pool) on their turn. Specifically, players could not initiate conversation with players who had more legitimacy tokens than themselves, and on their turns, players could initiate a number of actions equal to the number of their legitimacy tokens. These rules instantiate the freedom of action and voice associated with legitimacy. Study 2 therefore provides an important test of whether players will use power to increase power in another form without a direct relation between forms prescribed by the rules.

#### *Conditions and Information Availability*

Players again had identical quantities of power at the beginning and could view all players' tokens throughout the course of the game. Each player began with three

resource tokens, one force token, and one legitimacy token. The events ensured that the game was survivable by all players if they initiated no actions, that each player was required to have another player's obligation token once, and that each player was offered three choices by event cards.

### *Power and Its Use*

The same measures as in Study 1 were collected. In addition, after the game ended, we asked participants to rate how much they enjoy and how much they dislike playing strategy games (from 1, not at all, to 7, very much), and how often they play them for fun.

### *Validation Measures*

We administered a forced-choice validation measure to a subset of the participants ( $n = 65$ ). For each color of token, one questionnaire item referred to the token and another item referred to plausible actions one could take with the token. Instructions indicated that we were interested in learning participants' opinions about real-life analogies for various tokens and actions in the game. We designed each answer option to be appropriate to one of the four kinds of power and participants were asked to select the best option for each question. For example, one item stated, "Blue tokens are most similar to:" and the answer options were "a) an army" (representing force); "b) a promise" (representing obligations); "c) one's social reputation" (representing legitimacy; the correct answer); and "d) natural resources" (representing resources). Another question concerning an action one could take with a certain color of token read, "Giving another player your yellow token is like a) Making a commitment" (representing obligations, the correct choice); "b) Recommending that person for a job" (representing legitimacy); "c) Forcing that person to do something against his/her will" (representing force); "d) Splitting the rent" (representing resources). Thus, selecting the predicted responses would indicate that players are able to discriminate among each form of power and to translate the abstract instantiation of each form of power in the game into multiple arenas in ordinary life.

## Results

### *Conceptual Validity*

For each color of token, a majority selected the intended answer, averaging 72%. There were no differences in the rate of correct answers by participant gender, whether participants played strategy games for leisure or whether players were eliminated from the game.

### *Fungibility*

The events in Study 2 allowed all players to survive the game, but 20 of the 156 players in 13 of the 32 sessions were eliminated due to lack of resources. The

number of players eliminated differed from the expected value of zero based on the hypothetical passive game,  $t(155) = 4.77$ ,  $p < .001$ . As in Study 1, there was variation among sessions in that eight sessions eliminated one player each, four sessions eliminated two players each, and one session eliminated four players.

As in Study 1, we tested whether the mean level of each form of power accumulated differed from the mean expected by the hypothetical passive game (i.e., purely prescribed by the rules and events). To allow that players in a session were not independent, we used session mean of different forms of power to represent levels of power. Again, because we expected levels of each form of power to correlate, we set  $\alpha = .0125$  for each of the four tests. In Study 2, players accumulated reliably more legitimacy and more force than expected in a passive game, but reliably fewer resources (see test statistics in the bottom panel of Table 3).

As in Study 1, players in Study 2 accumulated different levels of three forms of power than would be expected had they not made active choices. We replicated the fungibility tests at both individual and session levels. The bottom panel of Table 4 shows the zero-order correlations among each color of tokens players had at the end of play (when they were eliminated or at game end). Even controlling for the number of tokens expected due to passive play (shown above the diagonal in the bottom panel of Table 4), players who accumulated more obligatory power also accumulated more force and more resources, whereas those who accumulated more legitimacy also accumulated more resources. As there were no rules guaranteeing these positive correlations, we can interpret these results as evidence that players used certain forms of power to gain other forms of power. Within sessions, inequality among the forms of power also tended to accumulate (see correlations of standard deviations in the bottom panel of Table 5). Both individual player and session results suggest that players used certain forms of power to gain other forms of power.

### *Consequences of the Use of Force*

We tested whether use of force increased inequality within sessions by using repeated measures ANOVA on the standard deviations of legitimacy tokens, force tokens, resource tokens, and obligatory advantage by whether or not force was used in a session. As shown in the bottom panel of Table 6, standard deviations were higher in sessions in which force had been used than in those in which it had not been used,  $F(1, 30) = 3.99$ ,  $p < .05$ , partial  $\eta^2 = .12$ . There was also a reliable effect for form of power,  $F(3, 28) = 29.3$ ,  $p < .001$ , partial  $\eta^2 = .76$ , but it did not interact with whether force was used,  $F(3, 28) < 1$ . As in Study 1, sessions in which force was used were characterized by greater inequality in all four forms of power measured.

As in Study 1, inequality (assessed using the standard deviation) in all four forms of power correlated with the proportion of players being eliminated from each session: for legitimacy,  $r = .48$ , for force,  $r = .35$ , for resources,  $r = .49$ , and for obligatory advantage,  $r = .50$ ,  $ps < .05$ . All of these correlations, except that with



standard deviation in force tokens, held when controlling for mean levels of resource tokens in a session,  $ps < .01$ .

Finally we examined how players' use of force affected survival. Using a mixed model ANOVA on whether each player survived the game, we examined whether there was a contextual effect resulting from players being in the same session. The variance due to session was negligible, allowing the use of regular logistic regression models. Using logistic regression, we examined whether each player's survival of the game was predicted by the number of times force was used in the player's session, the number of times the player had used force, and the number of times force was used against the player. We found that each time the player was a victim of force by another player, the victim player was 2.9 times more likely to be eliminated from the game,  $p < .05$ . Thus, the use of force in Study 2 had an even stronger impact on the survival of the target than was demonstrated in Study 1.

### *Player Gender*

The mixed-model analysis on whether or not a player used force showed a reliable session effect,  $p < .05$ , although the number of times a player was the target of force did not,  $p = .46$ . To provide a more stringent test, we report gender results by gender composition of session rather than by player gender. The results indicate that with larger proportions of male players in a given session, fewer resource tokens were accumulated,  $r = -.34$ ,  $p = .05$ , and more force tokens were accumulated,  $r = .34$ ,  $p = .05$ . However, the proportion of men in a given session was not related to whether force was used in a session,  $r = .03$ .

### Discussion

It is not unreasonable to expect power to be difficult to recognize. After all, in ordinary life, power is often disguised, hidden, or mislabeled or given apt labels with contradictory connotations (e.g., leadership, coercion). Nonetheless, people do have frequent experience with different kinds of power, and this knowledge evidently enables them to play an abstract game concerning multiple forms of power with multiple parties. Using a different validation method than Study 1, Study 2 also demonstrated that participants could discriminate among different forms of power (in this case, force, resources, legitimacy, and obligatory power) by observing their use. Validating these four forms of power distinctly shows that people can recognize forms of power from their use.

As with the validation results, Study 2 also replicated the Study 1 results of variation among sessions. Given the larger set of sessions of Study 2, we can now say with confidence that substantial variation between sessions of the In Game is to be expected. Indeed, such differences confirm that the game affords choices that produce local effects in the sphere of influence. Whereas in the typical social psychology experiment, variation among people in the same situation is considered nuisance error; with the present method, such variation is informative. The analyses we presented illustrate that emergent properties of groups can be quantified in dynamic power situations. In addition, the In Game method affords other statistical

techniques such as hierarchical linear modeling, non-linear dynamical systems (e.g., Vallacher, Read, & Nowak, 2002), and the social relations model (Kenny, 1994) that use interactive and multi-level relations among people.

Study 2 also afforded a test of whether people would use these forms of power fungibly. The adjustment to rules in Study 2 eliminated the only rule that offered direct fungibility between obligation and legitimacy and indeed those two forms were uncorrelated. Nonetheless, both studies demonstrate that, on average, and given a goal of survival in an uncertain environment, people will employ forms of power to accumulate other forms. In both studies, the levels of tokens actually accumulated were different than from the hypothetical passive game purely dictated by game conditions. In both studies, we found that use of force increased inequality among players in a session, and that both inequality and being the victim of force increased the likelihood that a player had too few resource tokens to “survive” the game.

## General Discussion

Our theoretical synthesis about power led us to develop a new method for studying power. Inventing a game allowed us to operationalize multiple needs and forms of power simultaneously within a field of influence, measure power both as potential and as exercised behavior, examine individual and collective consequences of power, and allowed participants to make constrained choices. In addition, the game allowed us to observe some of the more serious uses of power, including coalition-building, use of force, conferring status, de-legitimization, and starvation, without having participants actually harm one another. Evidently, our participants’ implicit knowledge about multiple forms of power enabled them to learn an abstract and complex game and play it competently in a short amount of time. We found that the four forms of power were used fungibly to create more power in some players than in others, especially when force was used. Inequality in the local environment and being a target of force decreased experimental “survival.”

Despite the game’s unfamiliarity, in several important respects, it mimics power in ordinary life. People do not typically label the kind of power they are employing, nor do people always know or announce their goals and intentions ahead of time. Rather, people often gauge what kind of power they and others have and anticipate how it may be used by observing behavior against a backdrop of opportunities. Power does occur in several forms, usually simultaneously, and people’s expectations about how people use or refrain from using power stems from their experience and self-insight. Each form of power can usually be used to gain another form of power, and people with deficits in one form (e.g., when no others are obliged to them) often have deficits in several forms (e.g., income, reputation). Events in life cannot always be anticipated, and we have no perfect knowledge of the future. We can try to promote our well-being, but none of us knows how long we will survive. Although clearly not an exhaustive emulation, these aspects of everyday life are reflected in the In Game. Further, both the play and the validation measures collected after play demonstrate that participants could distinguish among

the four forms of power and analogize them to everyday life and for a variety of actors.

The purpose of the present research, however, was not to mimic reality. Indeed, the artificiality of the situation was no doubt apparent to the participants as we told them that it was an experimental game for research purposes. The purpose of the game was to test whether participants would choose to make various forms of power fungible, and whether the exercise of fungible power creates inequality. By eliminating the conditions often theorized to induce the exercise of power and the production of social inequality (namely scarcity of resources, separate identities, and initial inequality), the present experiments provide a strong test of these hypotheses. In both experiments, players treated different forms of power fungibly, with the consequence that participants interacting with one another created inequality among themselves over time. Both experiments provide evidence that use of force, even in an egalitarian, survivable ecology, creates inequality and can endanger survival, especially for the targets of force. In both experiments, players accumulated more potential to use force when there were more men in their sessions. The present results, then, demonstrate that people can create inequality even in a survivable, non-zero sum environment, given the goal to survive and the uncertainty of meeting that goal.

Judgment of the importance of the present results hinges both on what one understands experiments on human behavior to accomplish and on particular constraints of the present experiments. As empiricists, we assume that to understand power, one should observe human behavior compared against standards rather than merely deducing logical possibilities. The present method is no different than other social psychology laboratory experiments in that the situation highlighted only those aspects that were theoretically important and held others constant. More importantly, all laboratory experiments, including the present ones, are existence proofs of particular causal processes. They instantiate conditions theorized to cause behavior in the lab and they test whether that behavior occurs. They do not demonstrate that what *did* happen in the lab does happen outside it any more (or less) than the present experiments do. By demonstrating evidence of the causal process and by ruling out alternative explanations by experimental control and through statistical hypothesis testing, experiments make more plausible the idea that the causal process in question does occur outside the experiment, particularly when replicated.

The only further question about the utility of present results, then, is whether they were already known, and whether there was something artificial about the laboratory conditions that accounts for the results. There are very few egalitarian societies and these have been demonstrated to have gender inequality or to change toward increasing inequality (see Collier, 1988; Hamamsay, 1957). Likewise, to our knowledge, complex inequality in multiple forms of power has not been demonstrated in experiments. Hence, the present existence proofs are new information: they demonstrate that zero-sum competition, social groups, structural inequality, differential access to resources, and social status differentials are not *necessary* to produce inequality because none of those conditions was present in these experiments. The condition that provoked the behaviors that produced

inequality was the goal to survive with events that made survival seem uncertain. Although its instantiation in a game is artificial, the goal to survive itself is not artificial: it has clear ecological validity.

There are at least four other artificial aspects of the In Game. However, there is no evidence to suggest they account for the results reported. Indeed, they show that the In Game method can be easily modified to test other hypotheses. First, turn-taking artificially regulated the exercise of choice and power. Turn-taking allowed reasonable pacing for the players and for them to anticipate their actions, and allowed a human experimenter to record the plays of the game. In everyday life, of course, actors do not always “wait their turn” to use power, and the timing may be very significant in the effective exercise of several forms of power. For example, offering the right price on the wrong day, or attacking with or without surprise, could lead to quite disparate consequences. A computerized version of the game could afford the opportunity to examine this issue more closely, investigating the temporal nature of power and its use in everyday interaction. Second, the information available to players could be considered artificially high. Players knew what events each player experienced, how all the players chose to act, that each player had the same goal of survival, and how much of each form of power each player had. Ordinarily, one only learns part of other people’s life histories and goals. Also, people at times hide some power that they have or even deliberately misrepresent their power and behavior, and some might not even know how much power they have until they try to use it. The manipulation of starting knowledge, player insight, and outcomes during the course of the game, however, is easily afforded through minor changes to the present design. Allowing players to decide how much of their power is revealed to other players would allow use of knowledge as a form of power. Third, players began the game at minimal acquaintance, with no special relationships to one another and no explicitly social goals. We assumed that we would not have to provide players with goals widely assumed to be chronic, such as to desire prestige and self-esteem. However, researchers who are especially interested in how relationships, identities, or particular social goals influence the use and consequences of different forms of power could easily adapt our method to operationalize any of these factors. Finally, starting conditions were egalitarian and the events made the game survivable for all players. More realistic starting conditions would begin with inequality. The present results not only demonstrate that fungibility can produce inequality, they provide a base-rate for comparison with future experiments.

A strength of the In Game method is that experimenters can unconfound naturally co-occurring forms of inequality. For example, although natural “social class” is characterized by differential legitimacy, asymmetric obligations, access to resources, and social contact between levels, our method allows researchers to test which, if any, of these conditions is necessary and sufficient to produce particular consequences. With simple changes to the events, rules, starting conditions, or goals given to players, a wide variety of social, legal, and economic conditions can be simulated, enabling a causal, detailed analysis of the important conditions in which power may be used to produce different ends. Moreover, allowing players to change or establish rules and label behaviors could be a way of studying people’s implicit

theories of power and morality, as well as studying deliberation and self-government. The In Game is a useful way of empirically testing a wide range of theories of power. A virtue of the method is that it forces the researcher to specify a number of parameters pertinent to power, such as the starting and ecological conditions, whether there are transaction costs to transforming one form of power to another, communication conduits, participants' goals and whether they are consensual and consensually known, the permanency or impermanency of alliances, the nature of fungibility, and the level of control participants have over power fungibility. Requiring researchers to specify such parameters can only improve theorizing about power and help us to know more specifically what the important conditions are for obtaining certain effects. Given the highly flexible nature of the game design and the ease with which it may be adapted to incorporate a wide variety of manipulations and measures, our broader approach and method may allow researchers to extend a social psychology of power to other domains, including economics, ecology, justice, international relations, social structure, and values.

Apart from the experimental method we introduce here, our integrated theoretical approach has other implications for the study of power. Economic approaches often define a wide variety of motivations and desires as “subjective value,” but our field theoretic assumption suggests that it is a question for behavioral science whether the objects and relationships people value (e.g., loyalty, money) can be converted or exchanged. Our consideration of the field of influence emphasizes that people have more potential assets and vulnerabilities than studies of power in dyads may suggest. Interdependence theory has emphasized power as being *relational*. However, our emphasis on power as enabling needs to be met points to important consequences of power that cannot be captured by relative descriptions of power alone. For example, one person may receive more calories than another, but if both are in a starvation ecology, their relative power may be immaterial because when their consumption drops below a minimum level, they will both starve. The relational perspective grounds power as a social phenomenon, but that would appear to have an ecological boundary condition such that some surplus above needs and some relationship to enable the transfer of power is necessary. Moreover, without ecological considerations, the abstract description of power within interdependence theory has trouble accounting for the important social facts that structural analysis has identified, namely that particular forms of power recur, and that power is repeatedly contested in particular arenas. By also considering ecological and structural features of the environment, along with the simultaneous operation of multiple forms of power, our integrated approach offers a theoretical framework for addressing these issues. This approach implies that by identifying basic, shared needs, one can predict what forms of power will be recurrent and the likely sites of conflict. Indeed, one could use the concept that power enables needs and desires to be fulfilled as a heuristic to generate further sites of power conflict. For example, the need to interact competently in one's environment implies that knowledge is another basic form of power, and suggests that education will be empowering and deception, an exercise in harmful power. By simultaneously considering different forms of power in relation to basic needs and in relation to other parties, our theoretical approach can enable an understanding not only of the power transformations that

Russell (1938) admonished we should, but just what power has to do with life conditions.

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