Bang Bang Shield Shield

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Abstract This document will detail how to play the game that we have come up with, *Bang Bang Shield Shield*, and offer some suggestions for the game's optimal strategy. First, we will discuss prior games that inspired our own.

1 The original game

1.1 Moves

According to this website, the main inspiration from the game comes from the popular two player version, named *Standoff*. In this version, players can do three things:

- Reload - Gains a bullet, can have up to 3(?) bullets.

- Shoot - Fires a bullet at another opponent. If they are not blocking, they lose. Loses a bullet in the process.

- Block - Blocks a bullet.

This game is relatively simple compared to our one. However, there are similarities.

- In both games, the best move is to reload, and for the same reason. Everyone starts with 0 bullets, so it is not possible to be shot. Hence, it is pointless to block, and you have no bullets to fire, so you should reload.

- In both games, you will lose if you get shot at without blocking. However, the concept of blocking is expanded upon in our game.

1.2 Premise

Both players start with 0 bullets. Both players clap their legs twice and then play their move. They are allowed to choose any of the three options at all times, except use **shoot** without any bullets. The game ends when one player gets shot by the other without blocking. If a player uses **shoot** without actually having a bullet to shoot, they lose.

1.3 Strategies

As mentioned before, reloading on the first move is the only logical option. However, the second move does not have any consistent strategy, all possible moves have a possible counter.

For example,

- Shooting next can be blocked.

- Blocking gives the opponent a chance to reload, which gives them a single bullet advantage.

- Reloading leaves you vulnerable to being shot.

After the first move, the game is analogous to a game of rock paper scissors. However, an additional complexity is added, as the number of bullets a player has accumulated should be considered when making a move. [1]

For example, if you have less bullets than your opponent, you may be tempted to reload, but since you are aware that your opponent also knows this, and is thus likely going to shoot, blocking may be your best best. However it could go any way. What this game does differently to rock paper scissors is that only one move can be played to attempt to win, and a specific move must be played first in order to do that. This forced sequence to win adds to the complexity of the game.

It has yet to be seen whether there should be a limit to the amount of bullets that a player can collect. Although it seems reductive to go above 3, which is quite rare in games, this may result in a situation where a series of psychological destructions of an opponent can allow you to obtain a ridiculous amount of bullets, which would add to the funny of the game.

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[1] As co-author Yape said, *"it's mostly psychological warfare"*, that is, your next move is dictated on what you expect your opponent to do.

2 The improved game

2.1 Moves

In the context of the game being three player now, we propose an expansion of how shooting works, and additional move alongside modifications to blocking, or, in our case, shielding.

Once again, you can choose any of the following moves at any time.

2.1.1 Reload

This is self explanatory, you are able to reload to gain a single bullet.

2.1.2 Shooting

In the original game, you can notate shooting as either a single finger gun or two finger guns. In our game, these options will carry different meanings.

You can either shoot someone with a single finger gun, shoot someone with both finger guns, or shoot both opponents with a single finger gun each(Henry, Ammon 10:18). Each of which can be blocked in ways that will be discussed below, but if the person or persons you shoot are reloading, they are eliminated from the game.

Note that if two people shoot each other, they are both eliminated, quickly ending the game.

2.1.3 Single shield

This is notated by crossing your arms in an "X" shape. If you do this, you are able to block a single bullet. For example, if person A fires a single bullet at person B, person B will successfully block it. The lore justification is that since the "X" is in the middle it will protect your center, and thus you will "live".

However, the single shield is unable to block either someone shooting you with two finger guns, or both other players shooting you with a single finger gun. It is also unable to block when there are more potent variants.[2] We suggest that the type of shield represents the specific number of bullets it can block, for example single shield blocks *just* one bullet, and double shield blocks *just* two bullets. This is to allow the number of active players to decrease to 2 as fast as possible.

2.1.4 Double shield

This is notated by raising both your forearms in a way that can be described as "putting up your guard" or "squaring up". This allows you to block two bullets.

However, if someone shoots a single bullet at you, you will lose. The justification for this is that this gesture leaves the center open for a single bullet.

Like the single shield, it cannot block against more potent variations of being shot at. In addition to this, if you are being shot by someone who is also shooting someone else, and you are using double shield, you will lose. Even though the other person is technically firing two bullets, you are only receiving one.

2.2 Premise

Three or more players start by hitting their lap twice. Each person makes their move, and then the remaining players will hit their lap twice again and repeat until only one person is left, or no people are left. A player wins if they are the last one standing. If no one is left, then it is a draw amongst the people who were alive in the previous round. If a person shoots without any bullets it counts they themselves being shot and so they are eliminated. [3]

2.3 Strategies

2.4 Points of interest

- In both games, the players may shoot each other such that no one is left standing. We consider this to be a draw.

- In the usual game, you can force a *"Stalemate"* in a sense, as you are not forced to shoot, hence you can just continuously block. In our game however, there is not one single move you can play which guarantees you survive the round. Any of the moves have their own potential counter-move associated with them.

- We labeled this a three player game, however it can in theory be played with as many people as possible. For example, a 10 person game could occur with the exact same rules, however this would be quite complex, and it would most likely rapidly progress to only two players being left, which is intentional.

- The reason for the suggested minimum of three players is due to the special shooting option where you can shoot two people at once(Henry, Ammon 10:18), hence three players at minimum are needed.

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[2] 3 bullets shot, 4 bullets shot. If you have more than three players, then $3 \le B \le 2n$ where B represents the total bullets that can be fired at a person during a single round.

[3] It has been suggested that if a person makes a mistake or illegal move, i.e. shooting twice without having two bullets, they are also eliminated in a similar fashion.

2.5 Example Game

In this example game, we have 3 players: A, B, C.

The game is as follows:

2.5.1 Demo Game

```
Round 1:
    Player A reloads.
    Player B reloads.
    Player C reloads.

    Remaining players: A, B, C
Round 2:
    Player B single shields.
    Player A single shoots Player B.
    Player C single shoots Player A.

    Player B single shielded.
    Player A did not single shield.

    Remaining players: B, C
Round 3:
    Player B reloads.
    Player C reloads.

    Remaining players: B, C
Round 4:
    Player B double shoots.
    Player C double shields.

    Player B double shielded.

    Remaining players: B, C
Round 5:
    Player B double shields.
    Player C single shoots.

    Player B did not single shield.

    Remaining players: C

Player C wins!
```

2.5.2 Game explained

Now the logic that occurred in the game will be explained, round by round.

1. In Round 1, all players reloaded. This is the evidently best strategy for both the original game and this game, for reasons discussed previously.

2. In Round 2, Player B single shielded but Player A fired a single shot at Player B. Because Player B single shielded, they are able to block the single bullet coming from Player A and live. As a result, Player A wastes a bullet. Additionally, Player C fired a single shot at Player A, who did not shield, and thus they are eliminated.

3. In Round 3, both remaining players reloaded. This gives Player B one bullet and Player C two bullets.

4. In Round 4, Player B used their two bullets to shoot Player C twice. However, as Player C had double shielded it was ineffective, so the two bullets were wasted.

5. In Round 5, Player C fires a single shot at Player B, who double shielded. As double shield only block *exactly* two bullets, and not one, Player B is eliminated, and so Player C wins.

2.6 Novel Games

Here are some unique games and/or cases. These should be self explanatory. Like the previous example, there are the same three players: A, B, C.

2.6.1 Fastest Draw

```
Round 1:
    Player A reloads.
    Player B reloads.
    Player C reloads.

    Remaining players: A, B, C
Round 2:
    Player A single shoots Player B.
    Player B single shoots Player C.
    Player C single shoots Player A.

    Player A did not single shield.
    Player B did not single shield.
    Player C did not single shield.

    Remaining players: null

Draw!
```

2.6.2 Winning By Default

```
Round 1:
    Player A reloads.
    Player B reloads.
    Player C reloads.

    Remaining players: A, B, C
Round 2:
    Player A single shoots Player B.
    Player B single shoots Player A.
```

```
247    Player C reloads.
248
249    Player A did not single shield.
250    Player B did not single shield.
251
252    Remaining players: C
253
254 Player C wins!
255
```

2.6.3 Psychological Harm

```
257 Round 1:
258    Player A reloads.
259    Player B reloads.
260    Player C reloads.
261
262    Remaining players: A, B, C
263 Round 2:
264    Player A reloads.
265    Player B single shoots Player C.
266    Player C reloads.
267
268    Player C did not single shield.
269
270    Remaining players: A, B
271 Round 3:
272    Player A reloads.
273    Player B single shields.
274
275    Remaining players: A, B
276 Round 4:
277    Player A reloads.
278    Player B double shields.
279
280    Remaining players: A, B
281 Round 5:
282    Player A reloads.
283    Player B single shields.
284
285    Remaining players: A, B
286
287 ...
288
289 Round ???:
290    Player A double shoots Player B.
291    Player B single shields.
292
293    Player B did not double shield.
294
295    Remaining players: A, B
296
297 Player A wins!
```

2.7 Nuanced Cases

The following will be excepts of possible games. As in before, there are the same three players: A, B, C.

2.7.1 Overkill

```
302 Round 1:
303    Player A reloads.
304    Player B reloads.
305    Player C reloads.
306
307    Remaining players: A, B, C
308 Round 2:
309    Player A reloads.
310    Player B reloads.
311    Player C reloads.
312
313    Remaining players: A, B, C
314 Round 3:
315    Player A double shields.
316    Player B double shoots Player A.
317    Player C double shoots Player A.
318
319    Player A is eliminated.
320
321    Remaining players: B, C
```

2.7.2 Double Kill

```
323 Round 1:
324    Player A reloads.
325    Player B reloads.
326    Player C reloads.
327
328    Remaining players: A, B, C
329 Round 2:
330    Player A reloads.
331    Player B reloads.
332    Player C reloads.
333
334    Remaining players: A, B, C
335 Round 3:
336    Player A single shoots Player B.
337    Player A single shoots Player C.
338    Player B reloads.
339    Player C reloads.
340
341    Player B did not single shield.
342    Player C did not single shield.
343
344    Remaining players: B, C
```

3   Next Steps

Going forward, I plan to release another paper, which discusses a Python implementation of this game and how *you* can submit player strategies to see which one is the most optimal. The details will be discussed at a later point, however the premise of creating your own unique strategy is that you are told the current round, the amount of bullets you have, and the moves that have been played by others prior. In other words, you are given the information that an actual human player would have in that situation, and your strategy should then select a move.

It'll be fun to see which strategy is the best!

Acknowledgements