Laws of Kimwipe Table Tennis

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Abstract
Kimwipe table tennis has become a famous scientific sport, but no rules of play have yet been firmly established. This study presents the first comprehensive framework for conducting the experiment. In this paper, I discuss balls, tables and rackets. In addition, the concept of Kim-Field is introduced in order to explain the correlation between the break and scores. Methods for evaluating players, however, still remain to be discussed.

1 Introduction
Since International Kimwipe Table Tennis Association (KTTA) was founded eight years ago, Kimwipe table tennis has become the most popular scientific sport in the world (in fact, this organisation initiated the notion of scientific sports). Experiments of Kimwipe table tennis are conducted in many places, but no rules for the scientific sport have yet been established. Although in 2012, KTTA (2012) announced rules for Kimwipe Table Tennis, they do not contain an adequate description appropriately stating the definition of balls and tables. So far, Kimwipe rules have followed those of table tennis as published by International Table Tennis Federation (2016), but those rules are not actually feasible for Kimwipe table tennis because they have too many restrictions and because Kimwipe play depends much on its surroundings.

This study consists of three sections. In the equipment section, I discuss what is needed to play Kimwipe table tennis. In the experimental section, I define the experiment’s process, including the new concept of Kim-Field. In the evaluation section, I consider how to score and decide the stronger player. Many sports have no scientific criterion for decisions such as ‘set point’ or ‘match point’. Kimwipe table tennis, in contrast, decides whether a player wins or loses based on statistical validity.

2 Equipment
In this section, I discuss tables, balls and rackets used in Kimwipe table tennis. Any other surroundings concerning Kimwipe table tennis cannot be defined because of the experiment’s flexibility for various environments.

2.1 Tables and Balls
As long as a ball bounces high enough to be hit, any ball and any table are suitable; however, in reality,
some conditions have to be satisfied to conduct the experiment.

The table’s surface must be horizontal and somewhat rectangular, but any type of surface is acceptable. Of course, although too small or too large a table is unsuitable for Kimwipe table tennis, the optimum surface size remains to be determined.

The table’s height depends on the experiment style. For seated conducting, the height must be lower than $7.6 \times 10^{-1}$ m, which is the lowest table tennis height (ITTF, 2016).

The table’s surface should be divided into two ‘courts’ by a ‘centre line’ at the halfway point of the surface’s longer sides.

Table tennis uses a net, but in Kimwipe table tennis, such a divider is not always necessary. However, the centre line must be explicit.

Any ball is acceptable, but the ball and the surface of the table must satisfy the condition that the restitution coefficient should be greater than $2^{-\frac{1}{2}}$, which means when the ball is dropped from a height of 2.0 m it bounces to a height of 1.0 m.

### 2.2 Kimwipes®

For rackets, we use Kimwipes® boxes. Since Kimwipes is a registered trademark of Kimberly Clark or its subsidiaries, we can distinguish Kimwipes boxes from other boxes. Only a box on which ‘Kimwipes’ is written is acceptable.

Whether the box contains Kimwipes does not matter, but nothing can be attached to the box except a price or name tag.

### 3 Experiment

Many sports use the terms ‘game’, but since Kimwipe table tennis is a scientific sport, a ‘game’ is called ‘an experiment’. In the experiment, players can discover how Kimwipe table tennis should be conducted to solve certain problems.

### 3.1 Kim-Field

Kim-Field is a field where the ball is in motion and bouncing. There are $n$ courts on the table’s surface (ordinarily $n = 2$, as mentioned). $C_i$ denotes the $i$-th court. $P$ is a series of the points at which the ball bounces. The ball bounces at $p_{i+1} \in P$ after it bounces at $p_i \in P$. $p_i$ must satisfy the following condition:

$$p_i \in C_j \ (i \mod n = j)$$

Kim-Field is generated by ‘generation’. Generation is conducted in the following way:

1. A player designated as the ‘generator’ has a ball in hand and is responsible for $C_i$.
2. The server hits the floating ball once with the racket.
3. The ball bounces at point \( p_k \in C_i \).
4. The ball bounces at point \( p_{k+1} \). Thus, a Kim-Field is generated.

If a generator fails to generate a Kim-Field, he or she gives a ‘point’ to other player(s).

A generation is very hard work, so players have to take turns generating.

3.2 Maintain a Kim-Field
Kimwipe table tennis is an experiment that attempts to maintain the Kim-Field. Each player should be responsible for an assigned court. To maintain the Kim-Field, the player responsible for \( C_i \) must make the ball bounce at a point \( p_{k+1} \) after the ball bounces at the point \( p_k \in C_i \).

To bounce the ball, players can hit the ball only with their rackets. Once a player hits the ball, he or she must not hit the ball again before another player hits the ball.

A ‘retention’ is a period during which the Kim-Field is maintained. When Kim-Field is broken, the player responsible for the break awards the other player(s) one ‘point’.

3.3 Scoring
All experiments end when one player’s points accumulate to a criterion previously determined by the players.

4 Evaluation
As a scientific sport, the aim of Kimwipe table tennis is to determine the player better at maintaining the Kim-Fields. Using the players’ scores is effective, but judging their proficiencies by merely comparing total scores is not easy. A point awarded to a poor player by a good player is more valuable than the reverse situation.

4.1 An experiment
In table tennis, the first player to 11 points wins (ITTF, 2016), but there is no reason that 11 points is rational. In 2001, the criterion was changed from 21 points to 11 points, increasing the probability of the weaker player winning the game (Noubary, 2007). However, although a player defeating a strong player with a score of 11–8 and a player defeating a weak player with a score of 11–8 make a big difference, the two scores are considered wins in the same way. If a win means the fact that one player is stronger than another one, players’ strengths must be taken into consideration.

A winner in table tennis must have a lead of 2 points. However, that the 2 points are statistically significant enough to show which player is stronger has not been proven.

4.2 Ranking
The number of wins or the ratio of wins and losses is useless for ranking players because each win or loss
differs in its characteristics. Even for one person, a win today differs from a win 10 years ago because the player’s strength varies. To address this problem, a network model in which the effect of a win or a loss decreases with time has been devised (Motegi & Masuda, 2012).

Another problem is whether or not all players can be completely ordered. Unless they play with all the other players on the same day, it seems impossible that each pair can be compared. However, a ranking system applicable to an incomplete tournament has been proposed (Jech, 1983).

5 Future work

This paper presents the first framework of conducting Kimwipe table tennis, but many factors and issues still need to be considered or revised.

5.1 Evaluation

As previously mentioned, evaluation remains a controversial issue. The concepts of an experiment and a ranking system need to be tackled simultaneously.

5.2 Differences between table tennis and Kimwipe table tennis

In table tennis rules, for example, a server must raise the ball at least 16 cm, and there exists the concept of a ‘let’ when the ball grazes the net. Since Kimwipe table tennis is not traditional table tennis, players do not need to follow each article in the rules of table tennis. In contrast, to assure the ease of play in Kimwipe table tennis, some aspects of table tennis can be adopted. But first, greater insight into their differences is needed.

References


