JOURNAL OF
EMERGING INVESTIGATORS

Article

Where to invest: Stock market indices versus mutual funds

Sanika Shah[1], Malika Shah[1]
[1] Centennial High School, Ellicott City, Maryland

SUMMARY

Individuals seeking to increase their wealth by investing in the stock market often look to mutual funds as a source of secure appreciation for their money. However, drawbacks to mutual funds include time, effort, and fees. Moreover, other profitable investment methods without the drawbacks of a mutual fund exist. Here, we examined whether exchange-traded funds tracking major stock market indices (S&P 500, Nasdaq Composite, and Dow Jones Industrial Average) are more profitable investments than actively managed mutual funds over ten years. Analyzing returns from the three stock market index funds and five of the largest actively managed mutual funds over a ten-year period will allow us to determine which investment strategy is more profitable. We collected data on annual and cumulative returns over the past ten years for each stock index fund and mutual fund and tracked how much $10,000 would be worth if invested in each of these funds. Our findings demonstrated significantly higher cumulative returns for stock index funds in comparison to mutual funds and rare occurrences of mutual fund outperformance in any year studied. Over time, the gap in the value of $10,000 invested in either stock index funds or mutual funds increased, as stock index funds outpaced the growth of mutual funds. Nevertheless, volatility across all index funds was comparable. Therefore, investing in major stock market index funds is likely more profitable than mutual funds in the long run. Except in dramatic downturns that may require active management, money could appreciate more with high exposure to stock index funds.

INTRODUCTION

A stock market is a center for the exchange of shares or equity in a public corporation (1). As shares are bought and sold, investors may realize capital gains when shares rise in value due to many variables and are sold above the price initially paid for it (2). To assess the trajectory of the United States (U.S.) stock market, we utilized three major indices: the Standard & Poor's 500 Stock Price Index (S&P 500), the Nasdaq Composite, and the Dow Jones Industrial Average. Each index is a weighted estimate of companies with some of the largest market capitalizations, or the total value of all public shares. Growth is measured by the average of the returns from all companies involved in the fund. The S&P 500 is considered one of the most comprehensive indices, as it includes 500 of the largest corporations from all sectors of the economy (3). By comparison, more than half of the Nasdaq Composite is composed of technology stocks (4). The Dow Jones Industrial Average has 30 companies that are highly stable and valuable (5).

Index funds are investment funds that mirror the performance of a specific basket of underlying assets in indices such as the S&P 500. Although investments cannot be made directly into stock indices, exchange-traded funds (ETFs) serve as a possible investment vehicle. ETFs have shares that are bought and sold in market transactions but hold a basket of assets like stocks and bonds to offer investors and avenue for diversification (6). Index-based ETFs invest in the same companies as those held by the index they are tracking, although prices are not necessarily the same since the prices of the companies are based on market supply and demand, while ETFs are priced off of the net asset value of their underlying assets (6). Unlike index-based ETFs, actively managed mutual funds are controlled by fund managers who collect money from multiple investors and select securities based on their goals, which are usually to minimize risk and maximize return. They are an attractive investment vehicle because they offer expert oversight in addition to diversification (investing in a variety of companies to lower risk) and accessibility to stocks that may otherwise be unaffordable, which is also common to ETFs (7). Mutual funds are generally classified as growth, value, or blend funds. Growth stocks are comprised of companies with projections for high growth, while value stocks are characterized by slow growth and low expenses. Blend funds invest in a wide range of industries without a singular focus on growth or value (8). Another key difference between index-based ETFs and mutual funds is their management styles. Index-based ETFs are passively managed, which means stock holdings are not regularly altered and instead remain constant based on the index they track. Conversely, mutual funds employ active management which includes stock picking by portfolio managers according to specific conditions, such as diversification and response to changing market trends.

Our study focused on ten-year returns from three major stock market index funds and five large mutual funds to determine the difference in returns from passively managed and actively managed funds. We hypothesized that stock market index funds would be more profitable than mutual funds. We formed our hypothesis based on the historical and continuous upward trend of the U.S. stock market, as well as the difficulty in consistently outperforming the market through active management (9). We found that stock market index funds achieved higher cumulative returns, and the annual returns from almost all individual years exceeded those of the

https://doi.org/10.59720/23-195

average mutual fund. Depending on an investor's goals, clear advantages exist for stock market index funds rather than mutual funds. Thus, basing investments on major stock index funds may improve investor profit.

RESULTS

We conducted a series of studies to examine the returns from stock market index funds and mutual funds over ten years. We chose to study the three major indices (S&P 500, Nasdaq, and Dow), as they measure the overall performance of the U.S. stock market. The exchange-traded funds tracking the three major indices were the SPDR S&P 500 ETF Trust (SPY), Fidelity Nasdaq Composite Index ETF (ONEQ), and SPDR Dow Jones Industrial Average ETF Trust (DIA). We selected five mutual funds that varied in capitalization and style. The first mutual fund as the American Funds Washington Mutual Investors Fund Class 529-A (CWMAX), a fund with a large market capitalization and broad exposure to all industries. The second mutual fund was the Fidelity Contrafund (FCNTX), which also has a large capitalization but retains a focus on growth stocks. The third was the American Funds American Mutual Fund Class 529-C (CMLCX), a value-based portfolio with a large capitalization. The fourth mutual fund is the Fidelity Low-Priced Stock Fund (FLPSX), also a value-based portfolio but with a medium capitalization. The last mutual fund is the DFA U.S. Small Cap Value Portfolio Institutional Class (DFSVX), a predominantly value stock portfolio with small capitalizations (10).

We first investigated the total percentage of returns after ten years from each of the three stock market index funds and all five mutual funds. Long-term investments usually run for ten years or more without withdrawals during the period, so cumulative returns are important in determining investment profitability. Major stock index funds outperformed mutual funds by nearly 150% at the end of the period, but the rate of change varied over time (**Figure 1**). At the start of 2016 and 2018, the rate of change dramatically increased and was sustained. Overall, similar types of funds had similar cumulative returns, except ONEQ, which stood out with an almost 250% return.

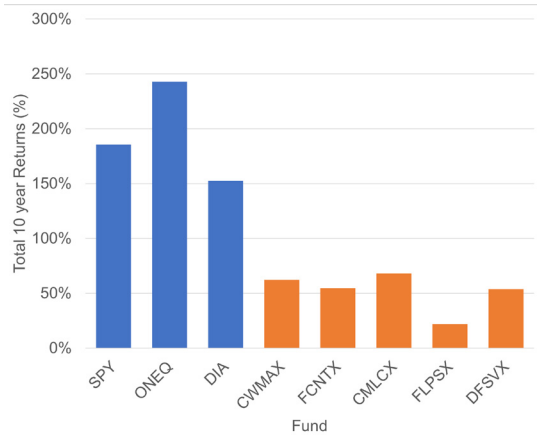

Figure 1. Cumulative 10-year percentage returns. Cumulative returns over the full ten-year period for each stock market index fund and mutual fund included in this study. Stock market index funds are blue, while mutual funds are orange. Yahoo Finance charts provided data on returns from 1/1/2013 to 1/1/2023 (22).

In the second analysis, we modeled the growth of $0,000 based on the average returns from all three stock index funds and the average returns from the five mutual funds. From 2013 to 2023, the value of an initial investment of $10,000 in stock market index funds was greater than that of mutual funds ($p < 0.025$) (**Figure 2**). Although both types of funds followed a similar growth pattern, stock index funds exhibited higher gains. Furthermore, annual percentage growth was also higher in stock index funds except for 2022 (year 10), when annual percentage growth from mutual funds was higher. We next examined the difference in average returns between the types of funds. Over time, the difference in the value of an investment in a stock index fund and a mutual fund increased (**Figure 3**). In particular, the year end of 2021 saw a nearly $20,000 difference in the value of an investment, the widest gap over the time frame.

In the fourth investigation, we examined the standard deviations of each fund as a measure of the volatility, or variation in stock price, experienced over ten years. We did not find any clear trend and rather demonstrated the similarity in volatility across all funds analyzed (**Figure 4**).

In our fifth and final examination, we assessed the frequency of outperformance of each of the five mutual funds compared to the average of the three stock index funds in any given year within the ten-year span from 2013 to 2023. In other words, we calculated the number of years a mutual fund outperformed the average of the index funds divided by ten years. The data shows how likely it is for a mutual fund to outperform stock index funds within a given year. We found that none of the mutual funds outperformed the stock index funds more than half of the time (**Table 1**).

DISCUSSION

We investigated whether exchange-traded funds tracking major stock market indices (S&P 500, Nasdaq Composite, and Dow Jones Industrial Average) are more profitable investments than actively managed mutual funds over the ten years from 2013 to 2023. We hypothesized that stock market index funds would be more profitable than mutual funds. Results were gathered from an analysis of historical stock data from the three major stock index funds and five large mutual funds. Examining annual and cumulative returns from the average of stock index funds and mutual funds, as well as similarities and differences across the individual funds, allowed us to determine that investing in major stock market index funds is likely more profitable than mutual funds in the long run.

Our results from the cumulative and annual returns in the past ten years from three major stock market index funds and five large mutual funds supported our hypothesis. Ten-year cumulative returns were greater in each of the stock index funds compared to each of the mutual funds. So, money invested in a stock index fund and left untouched for the past ten years led to a greater gain than placing the same amount of money in a mutual fund. Rarely did any given year have higher gains from a mutual fund. While periods of growth and decline were represented in both types of funds, the degree of appreciation was nevertheless greater with a stock index fund. Moreover, greater investment durations resulted in wider gaps between returns from a stock market index fund and a mutual fund.

It is important to note, however, that both types of funds

https://doi.org/10.59720/23-195

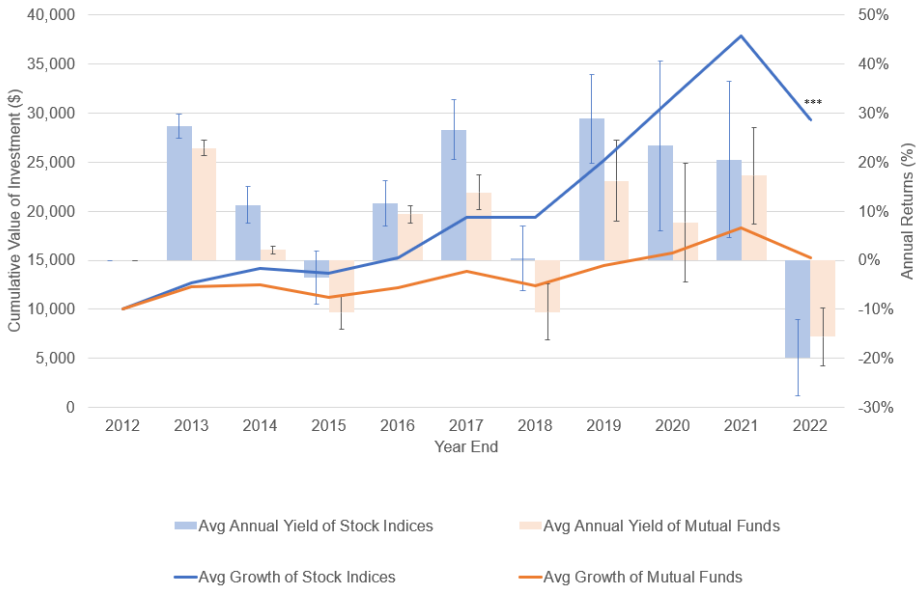

Figure 2. Average cumulative returns on a $10,000 investment and annual percentage returns over the full ten-year period. Average growth trends of $10,000 and the average cumulative returns of three stock market index funds (blue line) and five mutual funds (orange line) over a ten-year period (2012-2022). Along with this, year-over-year returns from the average yield of stock market index funds (blue bars) and mutual funds (orange bars) are shown. Error bars present standard deviation, and ***$p < 0.025$.

had similar directional trends, showing that any broad changes in markets were reflected in both funds. Before COVID-19 paused significant commercial business, the stock market was experiencing a decade of relative prosperity and recovery from the 2008-09 financial crisis that caused stocks to decline, losing roughly 50% of their value (11, 12). Thereafter, the Federal Reserve implemented measures aimed at quantitative easing, or the loosening of monetary policy to stimulate investment and growth. The next decade also saw some notable events in the U.S., such as the rise of Big Tech, the intensifying of foreign relations with China, and Trump-era tax decreases (13). Overall, external factors such as economic policy and consumer trends affected stock market trajectory by creating an environment for consistent growth and positive returns through the time period studied, confounding the relationship between an actively managed mutual fund's success and that of the broader stock market.

The one exceptional year in our data was year 10 (2022), in which mutual funds achieved higher annual returns, although both funds had a down year. We reasoned that a stock index fund does not have the ability to change their composition, a unique advantage of actively managed funds. Thus, index funds could not resist the big market downturn resulting from inflation concerns, while mutual funds could adjust for such short-term circumstances. Thus, in extreme situations, it may be beneficial to hold money in a mutual fund, which can actively minimize risk and exposure to volatile assets.

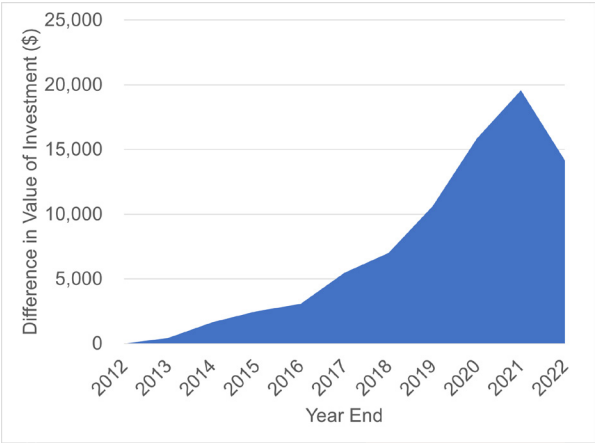

Figure 3. Difference in cumulative monetary value of $10,000 investment in stock market index funds and mutual funds. The value of $10,000 with average cumulative returns from five mutual funds subtracted from $10,000 with average cumulative returns from three stock market index funds.

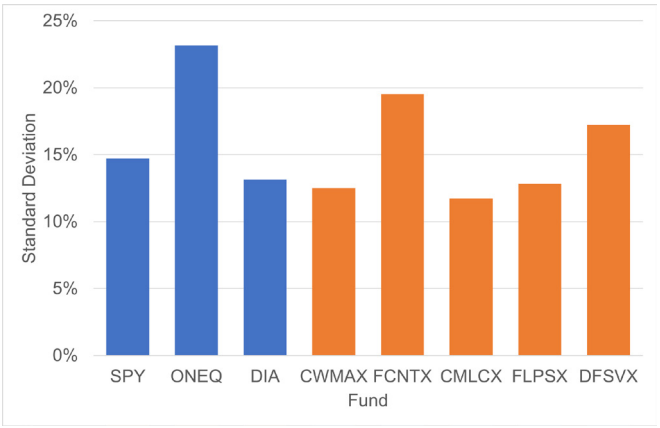

Figure 4. Fund volatility. Volatility of the three index funds and five mutual funds in this study, measured by the standard deviation of annual returns for each fund. Stock market index funds are blue, while mutual funds are orange.

https://doi.org/10.59720/23-195

Mutual Fund	Frequency of Annual Outperformance (%)
CWMAX	20
FCNTX	10
CMLCX	10
FLPSX	10
DFSVX	40
Average	**18**

Table 1. Percent annual outperformance of each mutual fund. Percentage of annual occurrences in the past ten years when each mutual fund outperformed the annual average return of the three stock market index funds.

Some limitations to the accuracy of our results include sample size and frequency of data collection. The study only investigated three stock market index funds and five mutual funds. However, great diversity exists in types of market index funds and mutual funds, including many other sectors or stock classifications that can have varying growth patterns and overall returns. In addition, we studied annual data, but monthly or quarterly returns could provide deeper analysis into trends and volatility. Furthermore, we utilized standard deviation as a measure of volatility, but other methods exist (14). For example, the capital asset pricing model (CAPM) is commonly employed to compare a stock's return to its risk. The model represents a stock's volatility relative to the broader market through mathematical calculations represented by the term beta (15). Lastly, the data in this study went back ten years, but analyzing even earlier performance may impact results. For instance, if the data went back 100 years, our results would be drastically different, as major world events including the Great Depression would lower returns. Moreover, ETFs and many mutual funds did not exist throughout the entirety of the last century.

Further corroborating the conclusions of this study is the efficient market hypothesis. Proposed in 1970 by professor and Nobel Prize Winner Eugene Fama, this hypothesis argues that known information is immediately reflected in the market price (16). Since news can be unpredictable, stock prices fluctuate in ways that professionally managed investments cannot predict. Hence, the chances of outperforming the stock market are low (17, 18).

To expand on this study, it would be interesting to examine ETFs, mutual funds, and other investment vehicles in greater detail. For example, future studies could consider the fees charged by a variety of mutual funds against their overall returns, which may widen the gap between returns from a stock market index fund and a mutual fund. Alternatively, ETF returns could be compared against their own individual stocks, which may have heavier weightage and consequently, a greater impact on the ETF. We would be able to determine what contributes to the ETF's returns and the strength of the diversification of the portfolio. One last consideration could be the best investment vehicle for an investor with a specific set of priorities or demographics, such as risk, time, age, and capital.

The S&P 500, Nasdaq Composite, and Dow Jones Industrial Average, investigated through their respective ETFs, have outperformed five mutual funds with a range of capitalizations and styles over the past ten years. Annually, the average returns from the stock index funds have almost always outpaced the average returns of the mutual funds, and the difference in cumulative gains has increased over time despite similarity in volatility across all funds. Accordingly, we argue that portfolio allocations should prioritize stock index funds over mutual funds to maximize gains.

MATERIALS AND METHODS

To determine the relationship between stock index funds and mutual funds, we first selected ETFs that are based on the three stock index funds we thought best encompassed the entire U.S. stock market. These were the S&P 500, Nasdaq Composite, and Dow Jones Industrial Average. Then, we selected five mutual funds that were diverse in size and focus, so that each fund did not hold the same securities. The chosen funds were American Funds Washington Mutual Investors Fund Class 529-A, Fidelity Contrafund Fund, American Funds American Mutual Fund Class 529-C, Fidelity Low-Priced Stock Fund, and DFA U.S. Small Cap Value Portfolio Institutional Class. Utilizing stock price data from Yahoo Finance charts, we collected annual percentage changes in prices for each of the funds from 2013 to 2023 and organized the data in Microsoft Excel sheets (19).

First, annual percentage returns were transformed into cumulative returns in dollar value based on an initial investment of $10,000, shown in **Equation 1**.

$$\text{APR} = \$10{,}000 * \left(\frac{annual\ returns}{100}\right) \qquad \textbf{[Equation 1]}$$

Then, the mean stock index fund return was calculated for each year (**Equation 2**), as well as the mean mutual fund return per year (**Equation 3**).

$$\text{Avg} = \frac{total\ return\ of\ stocks\ index\ funds}{number\ of\ index\ fund} \qquad \textbf{[Equation 2]}$$

$$\text{Avg} = \frac{total\ return\ of\ mutual\ funds}{number\ of\ mutual\ funds} \qquad \textbf{[Equation 3]}$$

Following this, **Equation 4** shows the difference in value between average stock index fund returns and average mutual fund returns per year was found for cumulative monetary values only.

$$\text{Diff} = avg.stock\ index\ return - avg.mutual\ fund\ return \qquad \textbf{[Equation 4]}$$

Total 10-year returns, average annual returns (**Equation 5**), and standard deviation of returns for each fund was determined (**Equation 6**).

$$\text{Avg} = total\ annual\ returns/number\ of\ years \qquad \textbf{[Equation 5]}$$

$$\text{SD} = \sqrt{\sum \frac{(yearly\ return - avg.returns)^2}{number\ of\ years}} \qquad \textbf{[Equation 6]}$$

Equation 7 was used to display how often each mutual fund outperformed the annual average return of the three stock market index funds over a decade. **Table 1** was derived from **Equation 7** by collecting annual returns for each mutual fund and finding the mean percentage of outperformance.

$$\text{Avg\%} = \frac{number\ of\ years\ when\ mutual\ fund\ returns\ were\ greater\ than\ stock\ indices\ returns}{number\ of\ years} \qquad \textbf{[Equation 7}$$

https://doi.org/10.59720/23-195

To verify the significance of our results in the monetary growth of $10,000 investment (**Figure 2**), a two-tailed t-test was conducted via **Equation 8.** The average cumulative returns on $10,000 invested in each fund over the ten year period, represented by x_1 and x_2, were compared. The test also utilized the standard deviations, s_1 and s_2, and the sample sizes, n1 and n_2. Applying the test to our results assumed that data was independent, normally distributed, continuous, and sufficiently large in terms of sample size (20).

$$t = \frac{(x_1 - x_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} \qquad \textbf{[Equation 8]}$$

Received: August 7, 2023
Accepted: July 27, 2024
Published: December 4, 2025

REFERENCES

1. O'Sullivan, Mary. "The Expansion of the U.S. Stock Market, 1885–1930: Historical Facts and Theoretical Fashions." *Enterprise & Society*, vol. 8, no. 3, Sept. 2007, https://doi.org/10.1093/es/khm075.
2. "Topic No. 409, Capital Gains and Losses." *Internal Revenue Service*. www.irs.gov/taxtopics/tc409. Accessed 21 July 2023.
3. "S&P 500." *S&P Dow Jones Indices.* www.spglobal.com/spdji/en/indices/equity/sp-500/#overview. Accessed 22 July 2023.
4. "NASDAQ Composite." *Nasdaq*. www.indices.nasdaqomx.com/index/Breakdown/COMP. Accessed 22 July 2023.
5. "Dow Jones Industrial Average." *S&P Dow Jones Indices.* www.spglobal.com/spdji/en/indices/equity/dow-jones-industrial-average/#overview. Accessed 22 July 2023.
6. Antoniewicz, Rochelle, and Jane Heinrichs. "Understanding Exchange-Traded Funds: How ETFs Work." *ICI Research Perspective*, vol. 20, no. 5, Sept. 2014.
7. Rouwenhorst, K. Geert. "The Origins of Mutual Funds." *Yale International Center for Finance,* vol. 1, no. 04, Dec. 2004.
8. "Morningstar Category – Funds." *Morningstar.* https://awgmain.morningstar.com/webhelp/glossary_definitions/mutual_fund/glossary_mf_ce_Morningstar_Category.html. Accessed 23 July 2023.
9. Price, Mike. "Average Stock Market Return." *The Motley Fool.* www.fool.com/investing/how-to-invest/stocks/average-stock-market-return/. Accessed 26 June 2024.
10. "List of the Top 100 actively managed U.S. stock mutual funds based on market cap." *Stock Market MBA*. https://stockmarketmba.com/listoftop100activelymanagedusstockmutualfunds.php. Accessed 25 July 2023.
11. Rahman, Mohammad Mazibar, et al. "Impact of early COVID-19 pandemic on the US and European stock markets and volatility forecasting." *Economic Research-Ekonomska Istraživanja*, 35:1, 3591-3608, 2022, https://doi.org/10.1080/1331677X.2021.1997626.
12. Dwyer, Gerald P. "Stock Prices in the Financial Crisis." *Federal Reserve Bank of Atlanta.* https://atlantafed.org/cenfis/publications/notesfromthevault/0909. Accessed 14 February 2024.
13. Wayne, Duggan. "25 of the Decade's Biggest Events on Wall Street." *U.S. News & World Report.* https://money.usnews.com/investing/stock-market-news/slideshows/decades-biggest-events-on-wall-street. Accessed 3 March 2024.
14. "Volatility." *Corporate Finance Institute.* https://corporatefinanceinstitute.com/resources/career-map/sell-side/capital-markets/volatility-vol/. Accessed 7 February 2024.
15. Harrington, Diana R. "Stock Prices, Beta, and Strategic Planning." *Harvard Business Review.* https://hbr.org/1983/05/stock-prices-beta-and-strategic-planning. Accessed 7 February 2024.
16. "What Is the Efficient Market Hypothesis?" *Forbes Advisor.* www.forbes.com/advisor/investing/efficient-market-hypothesis/. Accessed 25 July 2023.
17. Fama, Eugene F. "Efficient Capital Markets: A Review of Theory and Empirical Work." *The Journal of Finance*, vol. 25, no. 2, May 1970.
18. Malkiel, Burton G. "The Efficient Market Hypothesis and Its Critics." *Journal of Economic Perspectives,* vol. 17, no. 1, March 2003, https://doi.org/10.1257/089533003321164958.
19. "Yahoo Finance." https://finance.yahoo.com/. Accessed 26 June 2024.
20. Kim, Tae Kyun, and Jae Hong Park. "More about the basic assumptions of t-test: normality and sample size." *Korean Journal of Anesthesiology,* vol. 72,4 (2019): 331-335. https://doi.org/10.4097/kja.d.18.00292.