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Pre- and Post-Workout Supplement Consumption by Fitness Activities

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***Abstract*—**The global sports supplement market is experiencing rapid growth. While supplements consumed by regular gym-goers have been extensively studied, there remains a significant gap in statistics for other sports disciplines. This study collected and analyzed data on pre- and post-workout supplement consumption from respondents engaged in various fitness activities, including regular gym exercises, aerobics, ball sports, dance, Pilates, yoga, martial arts, water sports, CrossFit, mountain climbing, rock climbing, and other physical pursuits. Surprisingly, the findings challenge the common belief: a majority of respondents following strength training routines do not use pre-workout boosters or post-workout recovery products. On the other hand, some participants reported replenishing protein after cardio-only sessions. Notably, there is a discernible trend among randomly recruited individuals who prioritize pre-workout nutrients. Additionally, our study suggests that macronutrients, particularly protein, hold greater importance than micronutrients within fitness communities in South Korea.

This study aims to gain better insights into the emerging workout supplement market by focusing on Korean consumers. Additionally, further research on international markets, in collaboration with diverse partners, is anticipated.

***Index Terms*—post-workout, pre-workout, sports nutrition, sports supplements**

I. INTRODUCTION

RAIN, eat, and rest. These three fundamental principles underpin successful body transformations. While a balanced diet Tplays a crucial role in enhancing performance and recovery, it's no surprise that dedicated gym-goers and athletes often turn to sports supplements to optimize their nutritional intake. **Sports supplements**, also known as **sports nutrition products**, are dietary supplements designed for consumption before or after workouts. Their purpose is to boost energy, enhance athletic performance, and facilitate muscle recovery. These products typically contain a combination of vitamins, minerals, amino acids, and protein—essential nutrients that support overall well-being

Sports supplements come in various forms, including pills, ready-to-drink (RTD) protein beverages, gels, energy bars, and powders. While seasoned athletes have long been associated with supplement use, even newcomers to fitness routines encounter a diverse array of workout supplements.

This research delves into the sports supplement habits of Koreans actively engaged in physical activity. By examining consumption patterns within Korean fitness communities, the study aims to shed light on how pre- and post-workout nutrients are utilized. The findings contribute valuable insights to the rapidly expanding South Korean sports nutrition market. Additionally, the study explores the most common sports activities enjoyed by Koreans and correlate them with supplement consumption behaviors.

II. METHOD

A. Survey

Between October and December 2023, a survey involving 100 randomly recruited individuals from both online and offline channels was conducted. The objective was to understand the prevalence of pre-workout and post-workout supplement usage and explore the relationship between these consumption behaviors and participants' sports activities.

Respondents were actively involved in one or more workout programs, including gym exercises, aerobics, ball sports, dance, Pilates, yoga, martial arts, water sports, CrossFit, mountain climbing, and sports climbing.

The survey specifically examined the consumption of the following supplements: L-arginine, citrulline, caffeine, creatine, catechin, garcinia cambogia, taurine, beta-alanine, BCAA, EAA, glutamine, and protein.

Some survey participants engaged in follow-up interviews to provide additional context and explanations regarding their supplement choices and consumption patterns.

B. Demographics

The sample consisted of 100 Koreans spanning various age groups, from 10-19 to 70-79 years old.

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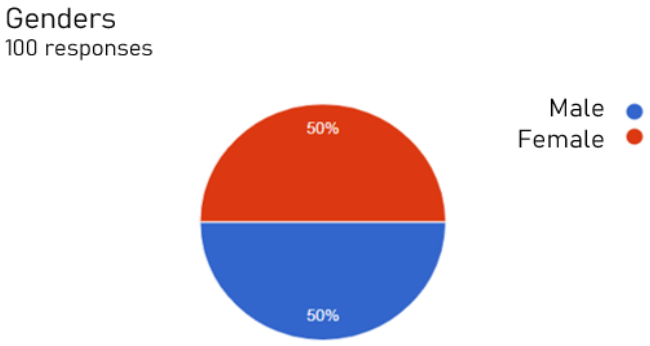

Fig. 1. Demographics: genders

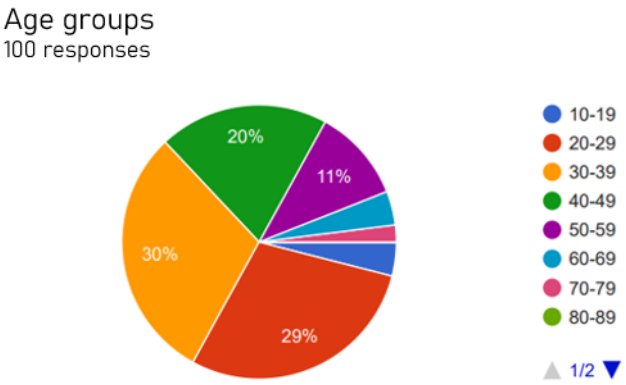

Fig. 2. Demographics: age groups

III. DISCUSSION

The survey first examined the workout preferences of Koreans engaged in physical activity. Here are the key findings:

Cardiovascular Exercises (47%): Cardio workouts were the most popular choice among respondents. Nearly half of them incorporated cardio into their routines or made it their sole fitness activity.

Weightlifting (43%): Weightlifting ranked second. As respondents had the option to select multiple activities, several weightlifters indicated that they engage in both aerobic and anaerobic exercises, highlighting their versatility.

Watersports (11%): Watersports primarily involved indoor swimming. A few respondents mentioned that they enjoy free diving or scuba diving as seasonal hobbies during follow-up interviews.

Dance (10%): Dance emerged as the fourth most popular sport. The Korean dance scene draws inspiration from Western and Latin styles, including hip-hop, ballet, salsa, bachata, Zumba, and tango.

Pilates (10%): Pilates gained traction in Korea relatively recently. Introduced in the early 2000s, it became more accessible to the public around 2010. Notably, a higher percentage of female respondents followed Pilates programs.

Yoga (7%): While fewer Koreans practiced yoga, it still found its place. Similar to Pilates, the majority of practitioners were female.

Rock Climbing (7%): Rock climbing boasts enthusiasts worldwide, and Korea is no exception. Despite scoring equally with yoga, climbers in our study demonstrated a more profound commitment to the sport and active engagement within related communities.

Ball Sports (6%): Soccer, baseball, golf, and tennis fell within this category. Fewer individuals participated in these sports than originally expected, likely influenced by the survey's timing during fall and winter.

Martial Arts (5%): Among the respondents, martial arts enthusiasts represented 5% of the sample. Disciplines such as Muay Thai, Jiu-Jitsu, and MMA featured prominently. Some respondents also categorized boxing and kickboxing within this group.

CrossFit (5%): Surprisingly, there were fewer CrossFitters than anticipated. Despite their robust online presence, questions arise about the actual size of the CrossFit community.

Mountain Climbing (5%): Though fewer in number, regular hikers participated in the survey. Most of them were in their 50s and 60s.

Others (1%): One respondent who initially selected "Others" also checked "ball sports." His explanation clarified that he wanted to highlight his basketball activity, while he also engaged in soccer. Consequently, we can include his response in the broader category of ball sports.

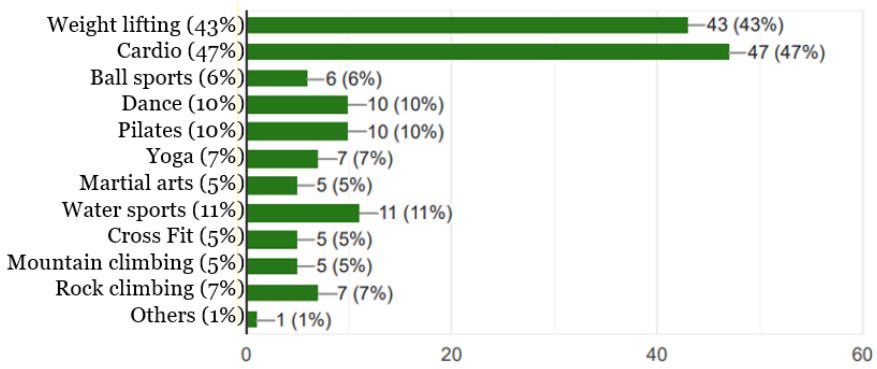

Fig. 3. Fitness activities enjoyed by Koreans

In the survey, participants were asked about their pre-workout supplement usage and preferences. The major discoveries are as follows:

No Dietary Supplements (62%): A significant portion reported not using any dietary supplements before working out. This group included weightlifters and individuals engaged in various fitness activities.

L-arginine (13%) and Creatine (11%): Among those focused on strength and endurance training for muscle growth, L-arginine (13%) and creatine (11%) were the supplements of choice. Interestingly, no women in the study consumed creatine, but L-arginine was taken by a few females participating in weightlifting, Pilates, and indoor climbing programs.

Caffeine (10%): Caffeine, whether from energy drinks, shots, powder, or regular coffee, was not widely consumed before sports activities. Its prevalence remained consistent across different workout types.

Taurine (10%): Taurine, often found in energy drinks or shots, was commonly paired with caffeine. Consequently, these two substances had similar consumption ratios.

Protein (8%): Protein supplementation was evenly distributed among various sports activities, including swimming, Pilates, gym workouts, running, and hiking.

BCAA (5%), Beta-alanine (4%), Citrulline (2%), and Glutamine (1%): These supplements were reported by bodybuilders and individuals following strict strength training regimens to achieve specific body transformation goals. Often, these substances were combined to enhance performance and increase energy.

In summary, pre-workout supplements were predominantly consumed by athletic individuals engaged in endurance activities or high-intensity strength training. Surprisingly, mountain climbers, dancers, and martial artists tended to avoid pre-workout consumption despite the intensity of their workouts.

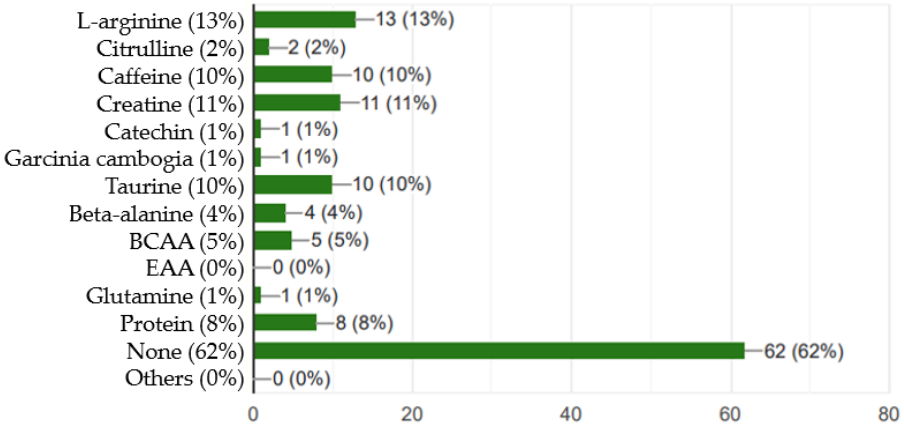

Fig. 4. Pre-workout supplement consumption

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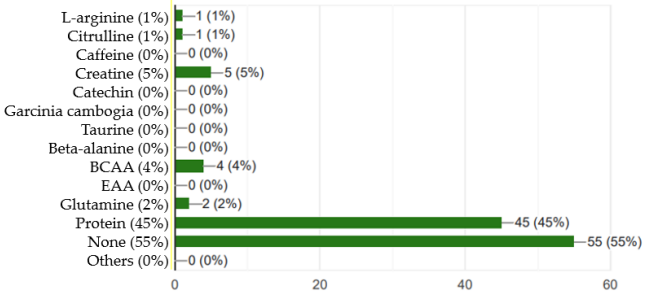

Fig. 5. Post-workout supplement consumption

The study reveals that opinions on post-workout supplements vary widely. These supplements, designed to be consumed within 30 minutes to 2 hours after exercise, don't resonate with everyone. Surprisingly, 55% of gym-goers surveyed reported that they did not take sports supplements following their workouts. Their reasons were intriguing: many expressed concerns about weight gain, fearing that eating after exercise might negate their hard work. Protein emerged as the top choice among those seeking post-workout nutrition, with 45% of respondents opting for it. This preference was particularly strong among individuals engaged in strength or endurance training, swimming, Pilates, and a small subset of cross-fitters who consistently included protein in their regimen. On the other hand, respondents involved in fitness activities such as soccer, basketball, tennis, hiking, and sports climbing had a different approach. They occasionally consumed protein shakes or protein bars, often when shared by workout partners or as part of brand ambassador partnerships. For this latter group, protein products were viewed as convenient snacks, and they didn't meticulously track their protein intake. Creatine, though less popular at 5%, still had a noticeable presence. Following it were BCAA (4%), glutamine (2%), L-arginine (1%), and citrulline (1%). These five substances were predominantly used by regular gym attendees who engaged in intense workout routines.

Creatine, a compound of three amino acids (arginine, methionine, and glycine), aids in retaining water within the body, supplying energy to muscles, and ultimately enhancing sports performance, hence it creates an optimal environment for muscle growth. **Branched-chain amino Acids (BCAAs)**—leucine, isoleucine, and valine—are essential nutrients and crucial for muscle health. Found in meat, dairy, and legumes, BCAAs play a pivotal role in stimulating muscle protein synthesis and potentially reducing muscle breakdown. **Glutamine** is the most abundant amino acid in the human body, serving as a fundamental building block for protein synthesis. Thus it aids in post-workout recovery. Our muscles produce glutamine, which then travels through the bloodstream to various organs. Additionally, glutamine contributes to the synthesis of other amino acids and glucose. Acting primarily as a vasodilator, **L-arginine** widens blood vessels, enhances oxygen uptake, and improves circulation. It also plays a key role in creatine production within the body. Although a nonessential amino acid, **L-citrulline** occurs naturally in our bodies. Unlike other amino acids, it doesn't directly contribute to protein synthesis. Instead, L-citrulline aids in the formation of nitric oxide (NO). NO is essential for dilating blood vessels and facilitating the release of growth hormone and insulin.

Regarding other substances, such as caffeine, catechin, garcinia cambogia, taurine, beta-alanine, and essential amino acids (EAAs), the study participants did not choose them as post-workout supplements. Their lack of familiarity with these elements suggests an opportunity to introduce the benefits of sports nutrition and related products to the Korean market.

Caffeine is typically consumed before a workout since it offers benefits for both endurance performance and high-intensity exercises. Additionally, caffeinated drinks like coffee can boost metabolic rates, leading to prolonged fat and calorie burning. Furthermore, caffeine aids in replenishing glycogen stores. **Catechin** is a substance found abundantly in green tea. It not only serves as a powerful antioxidant, reducing oxidative stress and inflammation but also accelerates recovery and enhances overall performance. Catechin's effects extend to fat and carbohydrate absorption, lipid metabolism, and increased energy expenditure. Derives from the fruit's rind, **hydroxy citric acid (HCA)** in garcinia cambogia inhibits an enzyme called citrate lyase, which the body uses to produce fat. Additionally, it elevates serotonin levels—a brain chemical that regulates hunger. **Taurine** is a semi-essential amino acid that is naturally produced by the human body. It can also be obtained from red meat or seafood. Taurine acts as an antioxidant, reducing oxidative stress. Moreover, it enhances oxygen uptake, thereby reducing muscle fatigue and improving endurance. **Beta-alanine** is non-essential and synthesized within the body. It's commonly used in supplements to enhance physical performance, aid muscle recovery, and support cognitive function. **Essential amino acids (EAAs)** are comprised of nine essential amino acids: histidine, isoleucine, leucine, lysine, methionine, phenylalanine, tryptophan, valine, and threonine. Three of these amino acids are also part of the BCAAs. Incorporating an EAA supplement before, during, or after a workout can stimulate protein synthesis, promoting an anabolic state conducive to muscle recovery and growth.

IV. CONCLUSION

The Korean sports supplement market is experiencing rapid growth, yet there remains untapped potential. Understanding the factors driving consumption choices and consumer perceptions is crucial for market exploration. Interestingly, Korean

fitness communities lag behind their counterparts in larger markets when it comes to harnessing the benefits of sports supplements. This discrepancy may stem from limited exposure to sports nutrition.

However, Koreans are known for swiftly embracing trends. By introducing scientifically validated products, we can foster a culture of informed and strategic supplement use. While survey participants predominantly favored complete protein products or protein-rich foods, there's room for more targeted approaches. Pairing complete proteins with micronutrients is essential for muscle recovery and growth. Individual amino acids and other nutrients, thoughtfully integrated into pre- or post-workout diets, can provide an extra boost, enhance muscle energy, improve performance, and aid in the recovery process.

Above all, consumer awareness and understanding are paramount. Educating users about viable options and the mechanisms behind these substances is key. Further studies involving each sports supplement's effect on various sports activities will unveil the true benefits and potential risks associated with these substances.

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