Ten guidelines for a healthy life:
Korean Medical Association Statement (2017)

Authors:
Chul Min Ahn, Jeong-Ho Chae, Jung-Seok Choi, Yong Pil Chong,
Byung-Chul Chun, Eun Mi Chun, Bossng Kang, Dai Jin Kim, Yeol Kim,
Jun Soo Kwon, Jacob Lee, Sang Haak Lee, Won-Chul Lee, Yu Jin Lee,
Saejong Park, Dongwook Shin, Kwang Ha Yoo, Dae Hyun Yoon,
Ho Joo Yoon, Jong Han Leem, Soo Lim, Hyeon Woo Yim

Editors:
Nayoung Kim, Sang Cheol Bae, Kyung-Hwan Cho, Hee Man Kim, Kil Won Kim,
Bossng Kang, Jun Soo Kwon, Jin Woo Lee, Won-Chul Lee, Yu Jin Lee, Soo Lim,
Tae Won Min, Yu Jin Paek, Hyeon Woo Yim, Ho Joo Yoon

Peer reviewed by Editors above mentioned
Editorial consultant: Sun Huh
Manuscript editor: Young Eun Kim, Eun Ju Shin, Ji Hyun Park
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Aims & scope: It aims at providing guideline to prepare Koreans for happy and health elder years in the age of extended life spans. It is expected to be a useful resources for the next generations as well. Its scopes comprise a variety of life style such as health habits, meals, exercise, sleeping, and technology adaption.

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The 35th Scientific Congress
of the Korean Medical Association
(KMA) 2017

Ten Guidelines for a Healthy Life

KMA
KOREAN MEDICAL ASSOCIATION

Preface

It is with the greatest enthusiasm that I express my congratulations on the publication "Ten guidelines for a healthy life: Korean Medical Association statement (2017)," which has been released on the occasion of the 35th Scientific Congress of the Korean Medical Association (KMA).

"Ten guidelines for a healthy life: Korean Medical Association statement (2017)" is significant because it has organized important health-related issues in a clear manner; this is especially important today, when a flood of imprecise information that can confuse the public surrounds us.

"Ten guidelines for a healthy life: Korean Medical Association statement (2017)" consists of 10 items that Koreans can easily put into practice. The guidelines are grounded in research that has been conducted among Koreans and are closely related to our everyday lives. It would not be an exaggeration to think of the "Ten guidelines for a healthy life: Korean Medical Association statement (2017)" as being 10 'commandments' for a healthy lifestyle.

The declaration includes information critical for improving our everyday lives and health. For example, it emphasizes the importance of understanding environmental diseases caused by particulate matter and other emerging infectious diseases, and presents guidelines for quitting smoking, drinking in moderation, eating a balanced diet, being physically active, having a regular sleep schedule, thinking positively, receiving routine health screenings, managing stress, and avoiding excessive exposure to mobile devices.

In the 70 years since the first KMA Congress was held in 1947, the academic society of the KMA, other organizations relevant to the KMA, policy planners, and the public have all participated in KMA Congresses. These meetings have made significant contributions to medical advancements and to communication between the medical field and the public.

It is especially meaningful to announce the "Ten guidelines for a healthy life: Korean Medical Association statement (2017)" at the 35th KMA Conference in 2017, as its focus is "Future Medicine and Healthy Aging," with the goal of establishing a new medical paradigm that advocates for the public interest and fosters social awareness.

I hope that these 10 guidelines for a healthy life do not serve only as a declaration. Instead, I hope that these guidelines are accompanied by continuous interest and effort, so that everyone can practice a healthy lifestyle.

Finally, I would like to express my respect and gratitude to the chair of the Organizing Committee of the 35th Scientific Congress of the KMA, Yoon-seong Lee, and the other committee members and staff members who have diligently invested their time and energy into the presentation of "Ten guidelines for a healthy life: Korean Medical Association statement (2017)."

MooJin Choo
President of the Korean Medical Association
President of the 35th Scientific Congress of the KMA

Preface

With the 35th Scientific Congress of the Korean Medical Association (KMA) being held this year, we announce the publication of "Ten guidelines for a healthy life: Korean Medical Association statement (2017)."

The KMA Congress is held every 3 years, and physicians from across the nation participate in it. The conference not only suggests future directions in medicine, but also provides Koreans with knowledge and information about living a healthy life. In the current circumstances, in which the domain of medical treatment is both expanding and becoming more specialized, it is the role of the KMA Congress to organize a program that focuses on a shared topic that is of interest both to medical professionals and to the general public.

As we enter the 'age of longevity,' Koreans are showing an increased interest in health, because a life that is extended in years without being healthy is not a lifestyle that anyone wishes to pursue. In the age of extended lifespans, chronic diseases such as hypertension or diabetes are considered 'lifestyle diseases' that can be prevented and treated through improving everyday habits so that one can enjoy a healthy life in old age.

Just like people put money into pension funds, "Ten guidelines for a healthy life: Korean Medical Association statement (2017)" is a 'health pension' that the 35th KMA Congress makes available to Koreans to provide them with happy and healthy later years. Having a healthy lifestyle, engaging in regular exercise, getting enough sleep, and having amicable relationships are prerequisites for a healthy life in one's later years, and these habits need to be practiced from early in life.

The publication "Ten guidelines for a healthy life: Korean Medical Association statement (2017)," which was developed this year, contains 10 selected items that are crucial for a healthy life and suggests guidelines that can be put into practice. These lifestyle guidelines are based on scientific evidence, grounded in recent research, and supported with references.

It is my sincere hope that "Ten guidelines for a healthy life: Korean Medical Association statement (2017)" will become a guidebook that prepares Koreans for happy and healthy elder years in the age of extended lifespans. These guidelines are expected to be a useful resource for the next generation as well.

On behalf of the Organizing Committee of the 35th KMA Congress, I would like to express my sincere gratitude for all the professionals from specialized fields who have participated in this project and dedicated their time and energy to writing these chapters, which contain accessible information based on scientific evidence, as well as to all the representatives of professional academic societies who served on the advisory board and have provided valuable suggestions and insights. I would also like to express my appreciation to the journalists who played an important role in shaping the development of these guidelines.

Yoon-seong Lee
President of the Korean Academy of Medical Sciences
Chair of the Organizing Committee of the 35th KMA Congress

Review and Recommendation

It is no exaggeration to say that we are flooded by false health information coming from unidentifiable sources these days. Unverified health-related information, and even false information, is deceitfully fabricated by the press and media, professional organizations, and patient groups, and is circulated through platforms such as social media and Internet forums.

Imprecise or distorted information can cause devastating side effects. It is especially important to take extra precautions regarding the harmful effects of false information regarding health.

When false health information is understood as factual, it both harms health on the individual level and can also have a negative effect on family members, the community, and even the medical field itself. The most important concern is when a patient is deceived by false health information and the trust between the patient and doctor is broken. This can lead to serious problems for public health throughout the nation. The "Anaki" (Korean acronym for 'raising a child without medicine') online community has emerged as a recent social issue, and is an example that demonstrates the seriousness of false health information and its implications.

The Korean Medical Association has aptly announced the publication of "Ten guidelines for a healthy life: Korean Medical Association statement (2017)." This work contains the '10 commandments' necessary for a healthy lifestyle at a time when it is most needed. There is no need to emphasize how well timed the announcement was.

The dictionary definition of "declaration" is "a formal statement of policies or stance to the public by a nation or organization." A declaration commonly includes a resolution or statement of volition for accomplishing a certain objective. Considering this fact, "Ten guidelines for a healthy life:

Korean Medical Association statement (2017)" summarizes the essential health practices that the Korean Medical Association strongly recommends the public to follow.

When I was asked to write a review and recommendation for this book, I carefully reviewed the guidelines and the authors included in this statement based on my career as an experienced reporter in the field of health. I also participated, from the very beginning to the end, in the yearlong production process that included numerous meetings and brainstorming with many professionals.

With this background in mind, I would like to emphasize that "Ten guidelines for a healthy life: Korean Medical Association statement (2017)" is the fruit of hard work by medical professionals who wish to continue to build a trustful relationship with the public.

Most credible is the reliability of each and every word in the guidelines, which can be supported by clinical and scientific evidence. I was also informed by the professionals who participated in the writing of the statement that any information that could possibly be considered controversial or insufficiently established was excluded from the guidelines.

Now it is the public's turn to make a difference. No matter how good the suggestions are, if the Korean public does not accept them and follow through with them, they become useless. I, myself, will start to practice the 10 guidelines with my family. I hope that "Ten guidelines for a healthy life: Korean Medical Association statement (2017)" will reestablish the trust between physicians and the public and become the new cornerstone of public health for the nation.

Kil Won Kim
Medical Reporter, Yonhapnews Agency
(Served as Acting President of Korean Science Reporter Association)

Progress Report and Acknowledgments

The Korean Medical Association (KMA) is South Korea's largest and most-trusted decision-making organization, made up of Korean physicians with a vision of being "professionals you can trust in the age of longevity." The KMA strives to fulfill its vision in accordance with its mission statement: "As professionals, we respect the dignity of human life and value of healthy living, and we practice the art of medicine to the best of our medical abilities and with the highest standard of ethics to safeguard the nation's right to health and medical treatment." The KMA provides the latest medical knowledge to its member physicians and represents primary care (including private practices), secondary, and tertiary care institutions, thereby mediating opinions among institutions. The KMA also assists in developing and implementing appropriate and effective medical policies by collaborating with medical administrative agencies such as the Ministry of Health and Welfare, the Ministry of Food and Drug Safety, and the Health Insurance Review and Assessment Service.

In the 70 years since the first KMA Congress was held in 1947, academic societies and other organizations relevant to the KMA, as well as policy planners and the public have all participated in KMA Congresses. These meetings have made significant contributions to medical advancements and to communication between the medical field and the public. The KMA Congress is the largest medical conference in Korea, and is held every 3 years. The 35th KMA Congress in 2017 set its focus as "Future Medicine and Healthy Aging," with the goal of establishing a new medical paradigm that advocates for the public interest and fosters social awareness.

To achieve this goal, a plan was made to publish "Ten guidelines for a healthy life: Korean Medical Association statement (2017)," a preparation team was formed, and the first meeting was held on November 30, 2016. In order to draft the 10 guidelines, Jong Chan Lee, a medical specialist in gastroenterology in the Department of Internal Medicine at Seoul National University Bundang Hospital, conducted a systematic literature review through multiple channels: 1) international organizations related to health (WHO, OECD, AHC, etc.); 2) governmental agencies of different countries (United States' HHS, United Kingdom's Department of Health, Japan's Ministry of Health, Labour and Welfare, and Germany's Federal Centre for Health Education); 3) top-ranking medical schools and hospitals (Johns Hopkins, Mayo, UCSF, Stanford, MGH, etc.); 4) Korean medical societies (KMA, the Korean Society of Nephrology, Korean Diabetes Association, etc.); and 5) other well-known physicians' blogs and similar online resources.

This review indicated that organizations rarely proposed comprehensive health guidelines on a group/organizational/institutional level and that the few proposals containing recommendations divided into items were limited to nutrition-based or disease-specific information such as cancer/diabetes prevention. With these results, the preparation team wrote the first draft, which contained 12 items, as the first step in developing a comprehensive and practical declaration for the entire public. On January 12, 2017, the preparation team held their second meeting, integrated additional research data, and finalized the "Ten guidelines for a healthy life: Korean Medical Association statement (2017)." These guidelines are: 1) quitting smoking, 2) drinking in moderation, 3) eating a balanced diet, 4) being physically active, 5) having a regular sleep schedule, 6) thinking positively, 7) receiving routine health screenings and immunizations, 8) managing stress, 9) paying attention to particulate matter and emerging infectious diseases, and 10) avoiding excessive exposure to mobile devices.

The preparation team held their third meeting on February 28, 2017 and decided to develop slogans representing the 10 guidelines (1 slogan

for each guideline) and a set of best practices to follow (3 practices per guideline). With the help of KBS News medical correspondent Kwang Shik Park, the team adopted 3 principles to use for selecting a total of 40 sentences for the slogans and practices to follow: first, consider current conditions in Korea; second, use easy and simple language; and third, give assurance to the people that each guideline is an 'all-in-one' source of information. During the fourth 10 guidelines preparation team meeting held on March 20, 2017, a total of 40 sentences for slogans representing the 10 guidelines (1 slogan for each guideline) and a set of practices to follow (3 per guideline) were selected, and a professional copywriter revised the language to make it easily understandable to the general public. Furthermore, rather than issuing "Ten guidelines for a healthy life: Korean Medical Association statement (2017)" as a one-time-only declaration, the team decided to publish it in the format of a book to help the general public continue practicing healthy living at all ages.

The content of the book goes beyond a simple list of 40 sentences; it includes details on each principle and steps to take, and contains references; thus, it meets both the objectives of being a book that is accessible to the general public and of having scholarly value. During the fifth meeting on April 28, 2017, Nayoung Kim, Bossng Kang, and Tae Won Min (a reporter for the Kukmin Daily Newspaper) selected the final 40 sentences from the 160 sentences drafted by the professional copywriter and medical specialist Jong-chan Lee. Then, the authors who were to write each guideline were notified of the final 40 sentences. The authors revised the 4 sentences corresponding to each guideline, and then they started to write the content in detail. Finally, the cover was chosen and the content for each guideline was circulated among many professionals in the field, academic societies, and related organizations for further revisions before the final publication.

We would like to take this opportunity to express our gratitude to Professor Hee Man Kim of Yonsei University Wonju College of Medicine, Wonju Severance Christian Hospital, who generously devoted his time despite his many obligations and helped edit and review all the manuscripts,

discovered contradictory content, and cross-checked the evidence for each sentence. We would also like to thank Secretary General Won-Chul Lee, who has given us continuous strong support. We also appreciate Professor Jun Soo Kwon for willingly drafting 4 of the 10 guidelines, Yonhapnews Agency reporter Kilwon Kim for initially providing the idea and setting up the framework for this project, Kukmin Daily Newspaper reporter Tae Won Min for the extensive help in drafting the 40 sentences, and Professor Bossng Kang, who assisted us greatly in drafting the guidelines for smoking and alcohol cessation.

Finally, we would like to express our sincerest gratitude to all the authors who participated in writing the 10 guidelines; this project was a great opportunity to present Korea's advanced level of medical science and its dedication to society. Furthermore, we believe that a revised edition of the book with content updated based on the latest medical research will be published before the next KMA Congress, which will be held in another 3 years, in order to continuously provide the general public with practical guidelines. We hope that active assistance from the KMA will help make this book readily available to more people to assist them in practicing a healthy lifestyle.

Nayoung Kim
Director of Academic Affairs, Korean Medical Association
Vice Secretary General of the 35th Scientific Congress of the KMA
TFT Committee Chair of the "Ten guidelines for a healthy life:
Korean Medical Association statement (2017)"

The 35th Scientific Congress
of the Korean Medical Association (KMA) 2017

TFT Committee of the "Ten Guidelines for a Healthy Life: Korean Medical Association statement"

TFT Committee Chair

Nayoung Kim	Director of Academic Affairs, Korean Medical Association, Vice Secretary General of the 35th Scientific Congress of the KMA

Committee Members

Sang Cheol Bae	Department of Rheumatology, Hanyang University Hospital for Rheumatic Diseases
Kyunghwan Cho	Director of Public Relation of Korean Medical Association, Department of Family Medicine, Korea University Anam Hospital
Bossng Kang	Department of Emergency Medicine, Hanyang University Guri Hospital
Hee Man Kim	Department of Gastroenterology, Yonsei University Wonju College of Medicine and Wonju Severance Christian Hospital
Kil Won Kim	Medical Reporter, Yonhapnews Agency (Served as Acting President of Korean Science Reporter Association)
Jun Soo Kwon	Department of Psychiatry, Seoul National University Hospital
Jin Woo Lee	Director of Public Relation of Korean Academy of Medical Sciences, Department of Orthopedic Surgery, Severance Hospital and Yonsei University College of Medicine
Won-Chul Lee	Vice President of Korean Medical Association, Department of Preventive Medicine, College of Medicine, The Catholic University of Korea
Yu Jin Lee	Department of Neuropsychiatry, Seoul National University Hospital
Soo Lim	Department of Internal Medicine, Seoul National University Bundang Hospital and Seoul National University College of Medicine
Tae Won Min	Reporter, The Kukmin Daily Newspaper
Yu Jin Paek	Department of Family Medicine, Hallym University Sacred Heart Hospital
Hyeon Woo Yim	Department of Preventive Medicine, College of Medicine, The Catholic University of Korea
Ho Joo Yoon	Division of Allergy and Pulmonary Medicine, Department of Internal Medicine, Hanyang University Seoul Hospital

(alphabetize)

Authors Profile

Chul Min Ahn, Pulmonary Division, Department of Internal Medicine, Gangnam Severance Hospital, College of Medicine, Yonsei University

Jeong-Ho Chae, Department of Psychiatry, Seoul St. Mary's Hospital and The Catholic University of Korea

Jung-Seok Choi, Department of Psychiatry, Seoul National University College of Medicine, SMG-SNU Boramae Medical Center

Yong Pil Chong, Department of Infectious Diseases, Asan Medical Center, University of Ulsan College of Medicine

Byung Chul Chun, Department of Preventive Medicine, College of Medicine, Korea University

Eun Mi Chun, Division of Pulmonary, Critical Care Medicine, Department of Internal Medicine, College of Medicine, Ewha Womans University

Bossng Kang, Department of Emergency Medicine, Hanyang University Guri Hospital

Dai Jin Kim, Department of Psychiatry, Seoul St. Mary's Hospital, The Catholic University of Korea

Yeol Kim, Graduate School of Cancer Science and Policy, National Cancer Center

Jun Soo Kwon, Department of Psychiatry, Seoul National University Hospital

Jacob Lee, Department of Infectious Diseases, Hallym University Kangnam Sacred Heart Hospital

Sang Haak Lee, Division of Pulmonary, Critical Care, and Sleep Medicine, Department of Internal Medicine, College of Medicine, The Catholic University of Korea

Won-Chul Lee, Department of Preventive Medicine, College of Medicine, The Catholic University of Korea

Yu Jin Lee, Department of Neuropsychiatry, Seoul National University Hospital

Jong Han Leem, Department of Occupational and Environmental Medicine, Inha University Hospital

Soo Lim, Department of Internal Medicine, Seoul National University Bundang Hospital and Seoul National University College of Medicine

Saejong Park, Korea Institute of Sports Science

Dongwook Shin, Department of Family Medicine, Samsung Medical Center

Hyeon Woo Yim, Department of Preventive Medicine, College of Medicine, The Catholic University of Korea

Kwang Ha Yoo, Division of Pulmonology and Allergy, Department of Internal Medicine, School of Medicine, KonKuk University

Dae Hyun Yoon, Department of Neuropsychiatry, Healthcare System Gangnam Center, Seoul National University Hospital

Ho Joo Yoon, Division of Allergy and Pulmonary Medicine, Department of Internal Medicine, Hanyang University Seoul Hospital

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Se Young Choung, Department of Preventive Pharmacy and Toxicology, College of Pharmacy, Kyung Hee University

Young-Chul Jung, Department of Psychiatry, Yonsei University College of Medicine and Severance Hospital

Jongsung Kim, Department of Family Medicine, Chungnam National University Hospital

Jong chan Lee, a medical specialist in gastroenterology in the Department of Internal Medicine, Seoul National University Bundang Hospital

Jung Eun Lee, Department of Food and Nutrition, Seoul National University

Kwang Shik Park, KBS News medical correspondent

Kyung Taek Rim, Occupational Safety and Health Research Institute, Korea Occupational Safety and Health Agency

Cheol Min Shin, Department of Internal Medicine, Seoul National University Bundang Hospital

Mi-Kyung Sung, Department of Food and Nutrition, Sookmyung Women's University

Hye Ran Yang, Department of Pediatrics, Seoul National University Bundang Hospital

Yong Kyu You, Nammoon Medical Clinic

Korea Occupational Safety & Health Agency

Korean Academy of Addiction Psychiatry

The Korean Academy of Family Medicine

The Korean Academy of Sleep Medicine (KASMED)

The Korean Academy of Tuberculosis and Respiratory Diseases

Korean Association of Psychoanalysis (KAPA): Study Group and Allied Center of the IPA

Korean Diabetes Association (KDA)

Korean Endocrine Society (KES)

Korean Medical Practitioners Association

Korean Neuropsychiatric Association (KNPA)

The Korean Nutrition Society

The Korean Society for Preventive Medicine (KSPM)

The Korean Society for Research on Nicotine and Tobacco

Korean Society for Study of Obesity (KSSO)

Korean Society of ALDH

Korean Society of Cancer Prevention (KSCP)

The Korean Society of Gastroenterology

The Korean Society of Infectious Diseases

The Korean Society of Medical Informatics (KOSMI)

The Korean Society of Neurogastroenterology and Motility

Korean Society of Occupational & Environmental Medicine

The Korean Society of Pediatric Gastroenterology, Hepatology and Nutrition (KSPGHAN)

The Korean Vaccine Society

Contents

Best practices at a glance

Guideline	Best practices to follow
1 Quitting Smoking	**Smoking shortens your life. Quit now!** 1. Quit smoking! If you decide to quit, tell people around you about your resolution right away 2. Looking for a shortcut to quit smoking? Consult with medical specialists 3. The best treatments for withdrawal symptoms are exercise, diet, and stress management!
2 Drinking in Moderation	**Stop peer pressure to drink, especially if someone's face turns red after only one shot** 1. Stop peer pressure to drink! Never force people to drink, especially those whose faces turn red after only one shot! 2. The zero-hangover formula: Always drink slowly and moderately over a period of 2-3 hours with water and/or food 3. When is your alcohol-free day? Frequent alcohol consumption increases the risk of cancer!
3 Eating a Balanced Diet	**A healthy life through a balanced diet in the age of longevity!** 1. Eat a carbohydrate:protein:fat ratio of 55:20:25 2. Reduce consumption of soda and sugar-sweetened beverages 3. Maintain the recommended caloric intake for a healthy diet
4 Being Physically Active	**Take care of your body by physically active lifestyle every day!** 1. Add physical activity to your daily routine! 2. Get up and move every 2 hours 3. The basic principle of weekly exercise: Do at least 150 minutes of brisk walking a week and perform muscle-strengthening activities on more than 2 days a week
5 Having a Regular Sleep Schedule	**Remember: Sound and regular sleep leads to a healthy life** 1. Maintain a regular wake-up time and if necessary, take a nap for less than 30 minutes 2. Get enough sleep 3. Thumbs up for regular daytime exercise! Thumbs down for caffeine, alcohol, and tobacco!

Guideline	Best practices to follow
6 Thinking Positively	**Appreciate the little things and be happy with your loved ones!** 1. Appreciate the little things 2. Stop comparing yourself to others, and be happy with yourself 3. Remember that happiness starts from good relationships! Empathy + communication + compassion!
7 Receiving Routine Health Screenings and Immunizations	**Health is a habit. Get screened and immunized while you're healthy!** 1. Participate in a national health screening program at each stage of the life cycle as part of leading a healthy life 2. Make sure that you receive the results of health screenings and practice the appropriate healthy habits 3. Receive timely immunizations for your own health and that of the community
8 Managing Stress	**Stress: If you can't avoid it, tame it!** 1. The power of positivity: Get rid of stress 2. Find your own coping strategies for stress 3. The vitality of your life: Engage in leisure activities at least once per week
9 Paying Attention to Particulate Matter (PM_{10} and $PM_{2.5}$) and Emerging Infectious Diseases	**Preventing damage from particulate matter and emerging infectious diseases paves the road to longevity!** 1. Refrain from going out and using cars when a particulate matter watch or warning is declared 2. Swine flu? MERS? Learning about emerging infectious diseases is important 3. Adhering to prevention practices for infectious diseases is the number-one component of health etiquette!
10 Avoiding Excessive Exposure to Mobile Devices	**Smart use of smart devices** 1. Avoid smartphones while eating 2. Avoid smartphones before sleeping 3. Keep smartphones away from babies

Ten Guidelines for a Healthy Life

01 Quitting Smoking

Chul Min Ahn, Division of pulmonlogy, Department of Internal Medicine, Gangnam Severance Hospital, College of Medicine, Yonsei University

Eun Mi Chun, Division of Pulmonary, Critical Care Medicine, Department of Internal Medicine, College of Medicine, Ewha Womans University

Sang Haak Lee, Division of Pulmonary, Critical Care, and Sleep Medicine, Department of Internal Medicine, College of Medicine, The Catholic University of Korea

Kwang Ha Yoo, Division of Pulmonology and Allergy, Department of Internal Medicine, School of Medicine, KonKuk University

Ho Joo Yoon, Division of Allergy and Pulmonary Medicine, Department of Internal Medicine, Hanyang University Seoul Hospital

Smoking shortens your life. Quit now!

01 Smoking shortens your life. Quit now!

Quitting Smoking

Summary

◆ **Background**

Smoking is the cause of a wide range of diseases. Quitting smoking is essential for a healthy life.

◆ **Purpose**

These guidelines suggest effective methods that can help smokers quit successfully.

◆ **Contents**

1. Quit smoking! If you decide to quit, tell people around you about your resolution right away

When quitting smoking, your willpower matters. However, your surroundings and people around you play a major role as well. Therefore, if you decide to quit smoking, tell as many people around you as possible that you're quitting and ask for their support. Support from others will reliably and effectively help you quit smoking.

2. Looking for a shortcut to quit smoking? Consult with medical specialists

The rates of successful quitting increase in proportion to the amount of time spent on smoking-cessation counseling. Even brief counseling sessions lasting less than 5 minutes each can increase cessation rates. Moreover, for smokers with nicotine dependence, counseling combined with medication is most effective.

3. The best treatments for withdrawal symptoms are exercise, diet, and stress management

After quitting, you may experience weight gain. An increase in weight may cause you to relapse and cause or aggravate cardiovascular diseases. Engaging in regular exercise, eating a healthy diet, and utilizing effective stress management techniques can alleviate withdrawal symptoms and help you control your weight.

◆ **Expected impact**

These guidelines will raise awareness of the importance of smoking cessation and increase quit rates by suggesting evidence-based smoking-cessation methods and programs.

◆ Best practices to follow ◆

1. Quit smoking! If you decide to quit, tell people around you about your resolution right away
2. Looking for a shortcut to quit smoking? Consult with medical specialists
3. The best treatments for withdrawal symptoms are exercise, diet, and stress management!

Smoking causes cardiovascular disease, chronic obstructive pulmonary disease, and lung cancer, thereby leading to premature deaths. Smoking not only causes firsthand damage via the smoke inhaled by the smoker, but also harms nonsmokers through exposure to secondhand smoke, which refers to smoke that has been exhaled and that comes from the burning end of a cigarette. Moreover, smoking has serious ramifications on the well-being of newborns, toddlers, and children, as smoking makes them more likely to develop respiratory diseases, otitis media, asthma, and decreased pulmonary function [1].

More than 70% of smokers wish to stop smoking and attempt to quit. Nonetheless, due to nicotine dependence, it is very difficult for smokers to quit of their own free will. The success rates of smokers who try quitting on their own are as low as 3%-5% [2]. For smoking cessation to be effective, we need to understand that smoking is not a mere habit, but is a chronic relapsing disease requiring repeated interventions [2]. In addition, smoking-cessation counseling and medications increase the successful quit rate when used together. Smokers who desire to quit should be provided with smoking cessation aids by medical

professionals, and those who do not should be provided with counseling to enhance their motivation to quit.

Fact Sheet ❶

Quit smoking! If you have decided to quit, tell people around you about your resolution right away

When quitting smoking, your willpower matters. However, your surroundings and people close to you play a major role as well. Therefore, if you have decided to quit smoking, tell as many people around you as possible that you're quitting and ask for their support. Even if you are determined to quit, challenges will appear, such as severe withdrawal symptoms in the early stages and the temptations posed by smokers around you who do not offer support. However, if you do not keep cigarettes at home, inside the car, or near your work environment during the first month of smoking cessation, or if none of your family members or colleagues smoke, success rates are higher.

Among the major health-related lifestyle habits, such as smoking, physical activity, and weight management, smoking is known to be the most heavily influenced by people around you [3]. If people close to you at work or at home smoke, quitting smoking can be difficult. In contrast, if those close to you are nonsmokers, your chances of quitting can increase

to 84%. It has been reported that if your spouse is a smoker, your chance of quitting decreases to 67%; if your sibling is a smoker, your chance of quitting decreases to 25%; and if your friends are smokers, your chance of quitting becomes as low as 36% [4].

Therefore, if you have decided to quit smoking, tell others around you about your resolution. If you have smokers around you, encourage them to quit with you. Doing so will increase your chances of quitting.

Fact Sheet ❷

Looking for a shortcut to quit smoking? Consult with medical specialists

2.1 Smoking-cessation counseling

Smoking-cessation counseling is a simple and effective smoking cessation method. A typically recommended set of guidelines for smoking-cessation, known as the 5 A's, is as follows:

1. Ask about his or her history of tobacco use (Ask)
2. Assess if he or she is willing to quit smoking (Assess)
3. Advise on quitting smoking (Advise)
4. Assist in quitting (Assist)
5. Arrange follow-up appointments to check on his or her smoking status (Arrange)

For smokers who do not intend to quit, medical specialists use the 5 R's, providing a guidance on:

1. The relevance and necessity of smoking cessation (Relevance)
2. The risks caused by smoking (Risks)
3. The rewards following smoking cessation (Rewards)
4. Methods to overcome roadblocks that may lead to failure (Roadblocks)
5. Repeating this counseling so that the patient is motivated to quit smoking (Repetition)

The rates of successful quitting increase in proportion to the amount of time spent on smoking-cessation counseling. Even brief counseling sessions lasting less than 5 minutes each can increase cessation rates. For smokers with nicotine dependence, providing counseling along with medication is most effective. A short smoking cessation counseling session of 3 minutes or less has been shown to result in a 1.66 times higher success rate, and the effect of counseling tends to increase relative to the duration of the counseling. It is recommended that smokers trying to quit should receive smoking cessation counseling at least 4 times over a period of 3 months, for a minimum of 10 to 15 minutes. Including group counseling along with individual counseling has also been reported to be effective [5].

2.2 Pharmacotherapy for smoking cessation

Smoking is a symptom of the disease of nicotine addiction. Medication is recommended, as counseling alone is generally not enough for successful smoking cessation. Pharmacotherapy for smoking cessation is recommended for all smokers who desire to quit, even for smokers who do not wish to use medications. The first-line agents for tobacco

cessation that have been approved by the Food and Drug Administration (FDA) and recommended for their usage in the U.S. and Europe include nicotine replacement therapies (NRTs; the patch, nicotine gum, lozenge, sprays, and inhaler) and oral medications, sustained-release bupropion and varenicline [6].

1. Nicotine replacement therapy

NRTs were developed in the 1970s and have been widely used in many countries. NRTs are used to reduce physiological and psychiatric withdrawal symptoms caused by tobacco cessation. NRTs come in 5 different forms: patch, gum, lozenge, spray, and inhaler. In Korea, only patches, gum, and lozenges are available. Even smokers with cardio-cerebrovascular diseases can use NRTs if they are in a stable condition (except for those who are hospitalized for acute cardio-cerebrovascular symptoms) [2]. Nicotine patches are the most commonly used NRT product. Smokers who smoke more than 10 cigarettes a day use 21 mg in the first 4 weeks, and gradually decrease to 14 mg for the following 2 weeks, and 7 mg for the next 2 weeks. Those who smoke 10 or fewer cigarettes a day are recommended to use 14 mg in the first 6 weeks, and then to decrease to 7 mg. The most common side effect is skin irritation. In clinical settings, users complain about patches because they easily fall off. Some users may experience tachycardia, chest pain, nausea and vomiting, or insomnia. Nicotine gum comes in 2 mg and 4 mg dosages. Those who smoke fewer than 25

cigarettes per day should use 2 mg, and those who smoke 25 or more cigarettes per day should use 4 mg. To reduce the risks of smoking for those who find it hard to quit entirely, medical specialists may recommend smoking less and using NRT products as supplements. Although the safety of NRTs for pregnant women, nursing women, or young adults has not yet been proven, some studies have reported that there were no serious adverse effects. However, for pregnant women, common NRTs do not affect smoking cessation, as the increase in metabolism during pregnancy speeds up nicotine decomposition [1].

2. Sustained-release bupropion

Bupropion, a norepinephrine dopamine reuptake inhibitor (NDRI), was initially developed as an antidepressant, but it was also found to help smokers quit smoking. In terms of its mechanism, bupropion can be considered as a top choice for smokers with depression, but clinical evidence is lacking. As the medication controls weight gain to some extent when administered, smokers who fear gaining weight in the early stages of smoking cessation may desire to try bupropion. Nonetheless, the weight gain control effect disappears 1 year after the therapy. Serious side effects include seizure (1 in 1,000 chance). As the risk of this side effect is dosage-dependent, a daily limit of 300 mg should not be exceeded: One tablet (150 mg) both in the morning and evening is recommended. Additionally, bupropion tablets should not be crushed because the medication comes in a sustained-release form. Moreover, to reduce the risk of seizure, it should not be taken more than once in 8 hours. As heavy drinking during administration of this medication increases the risk of seizure, drinking should be minimized or completely avoided. Other side effects include insomnia, headache,

and dry mouth. The standard regimen is 150 mg a day for the first 3 days orally every morning and then 150 mg twice a day for the rest of the course of treatment, for a total duration of 8 to 12 weeks. Sustained-release bupropion can be used for up to 6 months [1].

3. Varenicline

Varenicline is a smoking-cessation treatment medication approved in the U.S. in 2006 and in the U.K. in 2007. It works in a manner similar to nicotine, releasing dopamine constantly to reduce withdrawal symptoms. At the same time, it reduces the reward effects of nicotine. Through this double effect, smokers can quit smoking more easily. In a study that examined the smoking cessation effectiveness and safety of bupropion, the first-line agent for tobacco cessation, and varenicline, 1,027 smokers took these medications for 3 weeks and were followed up for 52 weeks. The subjects who took varenicline demonstrated a 2.7 times higher rate of maintaining abstinence for up to 52 weeks than the group given a placebo. In comparison, the subjects who took bupropion showed a 1.8 times higher rate of maintaining abstinence than those who received a placebo treatment [7].

During the first week before smoking cessation, the dosage should be increased gradually (0.5 mg a day from day 1 to 3; 0.5 mg twice a day from day 4 to 7). Then, 1 mg should be taken twice a day for 11 weeks. The duration may be extended for another 12 weeks, as necessary. The most common side effect is nausea, which has been reported in 17%-52% of cases. However, this symptom is generally mild and improves over time. Other side effects include insomnia, nightmares, and headache. Contraindications include suicide attempts or suicidal impulses. However, in a large-scale study conducted on more than 8,000

smokers, varenicline was not reported to lead to any higher of a risk for developing psychiatric symptoms such as suicidal impulses than NRTs, bupropion, or placebo. Currently, varenicline can be prescribed to all smokers except for pregnant women and those under 18 years old [8].

In March 2015, the U.S. FDA warned that varenicline can alter one's response to alcohol. This medication lowers alcohol tolerance and a drinker may become more easily intoxicated, possibly leading them to exhibit abnormal or violent behaviors [9]. In addition, the substance inhibits a person's ability to form memories while under the influence of alcohol. Therefore, those who take varenicline are advised to decrease their alcohol intake. Furthermore, although rarely, risks of seizure associated with varenicline have been suggested. The seizures associated with varenicline occurred mainly during the first month of its administration.

4. Electronic nicotine delivery systems: electronic cigarettes

Electronic cigarettes, or e-cigarettes, have increasingly been used in the U.S. since 2006. Their use is surging dramatically, particularly among adolescents.

According to a recent report by the U.S. FDA, the aerosol and liquid from an e-cigarette cartridge contain various toxic or cancer-causing chemical substances and ultrafine particles that can eventually lead to respiratory or cardiovascular diseases. E-cigarettes are mainly used by past smokers or current smokers, and as they tend to use regular cigarettes and e-cigarettes together, it is highly likely that users of e-cigarettes may progress to become smokers of regular cigarettes. Since insufficient studies have been conducted on the safety and usefulness of

e-cigarettes, it is not recommended to use them as smoking cessation aids [10].

Fact Sheet ❸

The best treatments for withdrawal symptoms are exercise, diet, and stress management!

When a person quits smoking, the metabolism rates that had increased above ordinary levels due to nicotine intake return to normal. As a result, the heart rate slows down by 10 to 20 beats and weight increases. Usually, weight gain occurs within 6 months after quitting, and ranges from 3 to 5 kg on average, up to more than 10 kg in some cases. Together with such weight gains, one may experience withdrawal symptoms such as depression, anxiety, excitement, or impaired attention. The combination of weight gain and withdrawal symptoms can trigger a past smoker to relapse and can cause or worsen cardiovascular diseases. Regular exercise strengthens physical fitness and controls the weight gain that comes with smoking cessation. Moreover, it reduces the withdrawal symptoms caused by nicotine addiction, increasing the success rate of quitting and helping former smokers to maintain abstinence. One study reported that those who exercised consistently for 12 months after quitting smoking maintained significantly higher quit rates [11]. When quitting smoking, the satisfaction that came from smoking is often replaced with eating. Therefore, adjusting one's diet by dividing a meal into small portions and eating it throughout the day or choosing nuts and low-calorie vegetables and fruits such as beans, dried fruits, celery,

and carrots over high-calorie foods like candy, crackers, and potato chips may provide higher satisfaction and help control weight.

Furthermore, stress in everyday life may trigger a relapse of smoking and negatively affect the probability of maintaining abstinence from smoking. Therefore, understanding one's own emotions, thoughts, behaviors, and physical changes that arise in stressful situations and developing coping skills to properly manage them are helpful for maintaining smoking cessation.

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Contributing associations:

» Korean Medical Practitioners Association

The Korean Academy of Tuberculosis and Respiratory Diseases

The Korean Society for Research on Nicotine and Tobacco

Korean Neuropsychiatric Association (KNPA)

Korean Society of Cancer Prevention (KSCP)

Korean Academy of Addiction Psychiatry

Contributing experts:

» Bossng Kang, Department of Emergency Medicine, Hanyang University Guri Hospital

Hee Man Kim, Department of Gastroenterology, Yonsei University Wonju College of Medicine and Wonju Severance Christian Hospital

Yu Jin Paek, Department of Family Medicine, Hallym University Sacred Heart Hospital

Ten Guidelines for a Healthy Life

02

Drinking in Moderation

Bossng Kang, Department of Emergency Medicine,
Hanyang University Guri Hospital

Stop peer pressure to drink, especially if someone's face turns red after only one shot

02 Stop peer pressure to drink, especially if someone's face turns red after only one shot

Drinking in Moderation

Summary

◆ Background

Koreans tend to have a genetically lower alcohol metabolism than Westerners, and are thus more vulnerable to alcohol. This fact is often ignored, even though it poses a severe health risk to Korean society, which is aggravated by the after-work drinking culture, where the pressure to drink is common. Even those with a relatively good alcohol metabolism show aldehyde toxicity symptoms after consuming the equivalent of half a bottle of soju (Korean distilled beverage).

◆ Purpose

1. To identify those who are extremely alcohol-sensitive and advise them not to drink.
2. To suggest a standard amount of alcohol consumption for occasional drinkers.
3. To help frequent drinkers reduce their alcohol consumption and understand the health risks of regular drinking.

◆ Contents

1. Who still likes to force others to drink these days? "Cheers, except for those whose faces turn red after only one shot!"

Those who have a flush reaction to one shot of soju or one glass of beer (180 mL), or who had such a reaction when first exposed to alcohol in their late teens or early 20s, are deemed to have a genetically weak alcohol metabolism. These people should not drink alcohol at all, nor should they be invited to.

2. The zero-hangover formula: Always drink slowly and moderately over a period of 2-3 hours with water and/or food

Occasional drinkers who drink 1-3 times a month are recommended to consume alcohol with water and/or food slowly over 2-3 hours to prevent hangovers the following morning. The standard alcohol limit for males is 3-4 shots of soju, 2 cans of beer, or 2 glasses of wine, while 2-3 shots of soju, one can of beer, or one glass of wine is considered the cap for females.

3. When is your alcohol-free day? Frequent alcohol consumption increases the risk of cancer

Frequent drinkers are advised to designate alcohol-free days to reduce their alcohol consumption.

◆ Expected impact

To help protect those vulnerable to alcohol and promote a healthy drinking culture.

◆ Best practices to follow ◆

1. Stop peer pressure to drink! Never force people to drink, especially those whose faces turn red after only one shot!
2. The zero-hangover formula: Always drink slowly and moderately over a period of 2-3 hours with water and/or food
3. When is your alcohol-free day? Frequent alcohol consumption increases the risk of cancer!

Fact Sheet ❶

Stop peer pressure to drink! Never force people to drink, especially those whose faces turn red after only one shot!

Mr. Kim, a Korean businessman in his early 30s, is afraid of company dinner outings. His senior colleagues always insist he drink with them over dinner. He has a flush reaction all over his face and body after just one shot of soju, accompanied by a rash and skin irritation in severe cases (Fig. 2.1). However, his seniors continue to force more drinks upon him, claiming that they saw on TV that "a small amount of wine is said to prevent aging and is good for your cardiovascular system and skin." They also believe that he should drink more to increase his tolerance for alcohol. Mr. Kim often feels a headache, escalated heartbeat, and nausea after drinking.

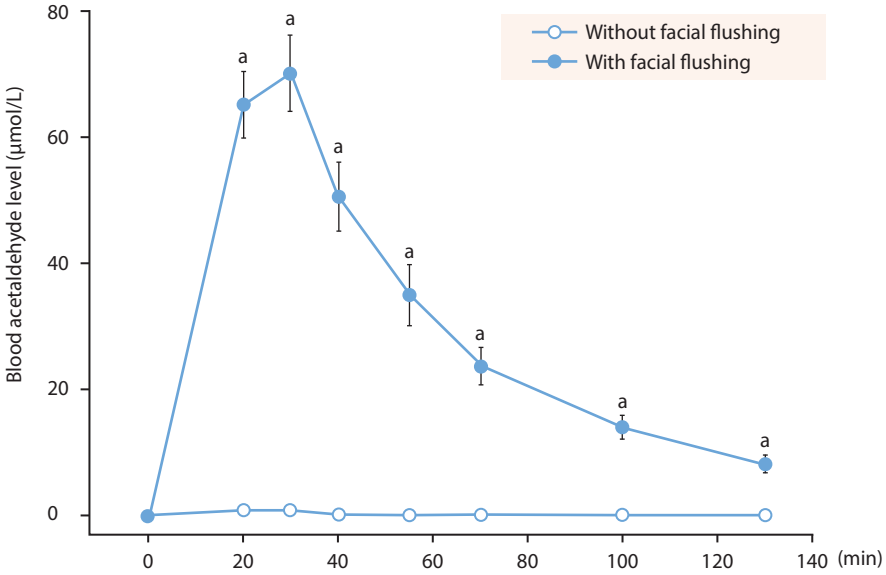
Figure 2.1 **Facial flushing after a minimal amount of alcohol.**
Before (left) and after (right) drinking alcohol. A 22-year-old Asian male with a less functional aldehyde dehydrogenase enzyme (an ALDH2 heterozygote) due to genetics. (Adapted from Brooks PJ et al [1])

Why does this happen to Mr. Kim?

Why does even a small amount of alcohol affect him this way? Ethanol, the intoxicating substance in alcoholic drinks, is first converted to acetaldehyde, which is toxic, by alcohol dehydrogenase (ADH). Then, in the second step, acetaldehyde is converted to acetate by aldehyde dehydrogenase (ALDH). A less functional ALDH enzyme leads to increased acetaldehyde accumulation inside the body, which causes facial flushing, headaches, and an increased heart rate [1]. Those with a severe flushing reaction in response to even small amounts of alcohol are considered to have a genetic ALDH deficiency, which causes their bodies to rapidly accumulate a large amount of toxic acetaldehyde

even after drinking only a small amount (Fig 2.2). The alcohol flush reaction is more common among East Asians than Westerners, and has been reported to affect 35%-37% of Korean, Chinese, and Japanese people[1,2]. Those who experience a decrease in this symptom with age, but experienced the alcohol flush reaction when first exposed to alcohol in their late teens or early 20s, are also considered to have this condition. The Japanese, Chinese, and Korean populations are estimated to have this condition at rates of 45%, 30-33%, and 30%, respectively. In contrast, it is found significantly less often in other Asian populations,

Figure 2.2 **Comparison of blood acetaldehyde concentrations over time between adults with and without facial flushing after consuming 3 shots of soju.** (Adapted from Peng GS et al [3])



including Indians, Filipinos, and Malaysians. The condition is rare among Europeans, North Americans, and Africans [2].

An individual who inherits just one dysfunctional allele of the gene from one of his or her parents will develop ALDH deficiency.

Acetaldehyde is the key driver of acute and painful hangover symptoms. It has also been established to be Class 1 carcinogen to human according to WHO, that causes malignant tumors upon prolonged exposure. Therefore, if you urge people whose skin easily flushes after one shot of alcohol to drink, you are essentially forcing them to absorb a glass full of carcinogens [1,3,4].

Unfortunately, this 'secret' regarding alcohol breakdown in those of East Asian descent has not been well advertised to the public. Those who are particularly defenseless against alcohol are unprotected in modern Korean drinking culture. Modern Korean social and organizational culture has a liberal attitude toward alcohol. Along with this attitude, people are exposed to frequent depictions of binge drinking in mass media and the notoriously rampant practice of forcing people to drink at after-work company dinner events [1].

In fact, these people should not even consume a tiny shot of alcohol for the sake of their health, let alone be pressured to drink with others.

As a conclusion, I would like to suggest the following toast:

"Cheers, except for those whose faces turn red
after only one shot!"

Fact Sheet ❷

The zero-hangover formula: Always drink slowly and moderately over a period of 2-3 hours, with water and/or food

Standard alcohol consumption	
Males (per session) 3-4 shots of soju (2 cans of beer or 2 glasses of wine)	Females (per session) 2-3 shots of soju (1 can of beer or 1 glass of wine)

Individual tolerances for alcohol are difficult to define, but standard healthy drinking limits are considered to be amounts that do not bring any discomfort to an individual the following morning. An occasional drinker who consumes alcohol 1-3 times a month or once a week or less is advised to follow the above recommendations and drink slowly over a 2- to 3-hour period in order to stay safe and prevent any discomfort the next morning [5-7]. One shot of soju is defined as 50 mL of soju with 20% alcohol by volume (ABV) for males, the equivalent of four-fifths of a regular soju shot glass, and 40 mL of 18% ABV soju for females, equivalent to three-fourths of a shot glass. One can of beer is defined as 355 mL of 4.5% ABV beer, and one glass of wine as 150 mL of 12% ABV wine, approximately half of a standard wine glass.

High-risk drinkers are males who consume 12 shots or more of 18% ABV soju a day or females who drink 10 shots or more of 18% ABV soju a day. This is equivalent to six 355-mL cans of 4.5% ABV beer for men and 5 cans of the same beer for women [6]. Binge-drinking is consuming the same amount of alcohol over 2 hours of time. Even a single round of

such high-risk drinking or binge drinking may lead to acute arrhythmia and coronary artery disease requiring hospitalization [7]. Such drinking habits are also linked to various health and social issues, including sexually transmitted infections, unwanted pregnancies, violence, injury, and drunk driving.

Inside the body, alcohol is first converted to acetaldehyde and then converted to acetate by the ALDH enzyme. Frequent drinking promotes a different set of enzymes, collectively known as the microsomal ethanol oxidizing system, which metabolizes more alcohol and acetaldehyde, corresponding to an increased drinking capacity. However, occasional drinkers who drink 1-3 times a month may experience intoxication from an accumulation of acetaldehyde once they consume a high level of alcohol, even if they have normal ALDH function [7,8]. This is called an alcohol hangover (Fig 2.3).

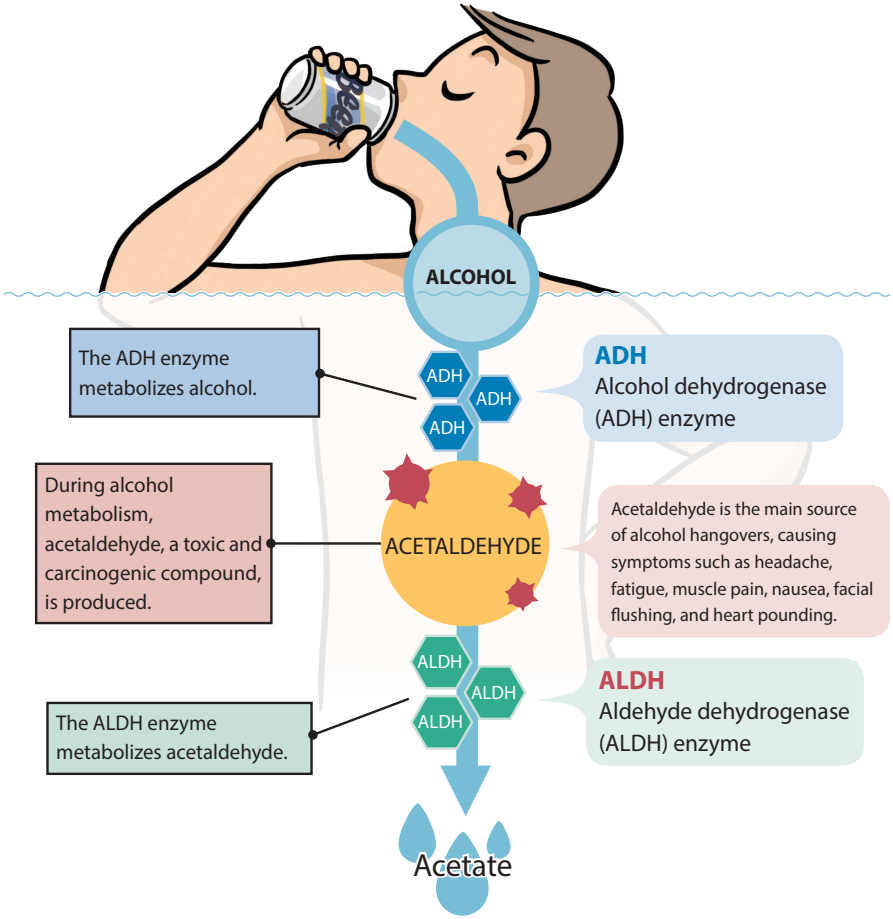
In general, alcohol intake around 8-10 PM makes you feel a little tipsy but energized. However, 6 hours later, around 3-4 AM, even if you are mentally sober as your blood alcohol level drops to 0, you are still intoxicated from the acetaldehyde, and hangover symptoms may be at their worst, as your acetaldehyde level peaks [8,9]. An individual's tolerance for alcohol depends on physique, age, gender, fatigue, and health conditions, as well as the frequency of alcohol consumption. The average tolerance for alcohol of a healthy 60-70 kg male occasional drinker who drinks 1-3 times a month is 4-5 shots of 18% ABV soju [3,6,7,9].

The problem lies in the fact that Korean drinking culture discourages people from limiting their alcohol consumption to the "healthy drinking limit" standards. A senior colleague who frequently drinks and has a

highly active microsomal ethanol oxidizing system is likely to encourage a junior coworker to drink more alcohol than he or she can tolerate. In reality, this means forcing your subordinates to consume a liquid toxin, only to have them be incapacitated for work the next day.

Figure 2.3 **Metabolism of alcohol and substances that cause hangovers**

People with a good aldehyde metabolism may still suffer from aldehyde toxicity upon consuming half a bottle of soju or more. (Provided by PICO Entech Co. Ltd.)



Fact Sheet ❸

When is your alcohol-free day? Frequent drinking leads to an increased risk of cancer!

It is recommended to limit your number of drinking sessions to once a week, but men who drink as frequently as 2-3 times a week should make it a priority to limit their total weekly consumption of alcoholic drinks to less than 2 bottles of 18% ABV soju (1 bottle = 360 mL) [5,10]. This corresponds to eight 355-mL cans of beer with a 4.5% ABV or seven 150-mL glasses of wine (half a regular wine glass) containing 12% ABV. If the total amount of alcoholic drinks consumed in a week is close to 2 bottles of soju, it is recommended that a person consume that amount over at least 3 days. Women should consume no more than half of the standard amount for men [10].

Frequent drinking episodes may increase one's chances of developing mouth, throat, larynx, colon, liver, and breast cancer, even if you drink a moderate amount per session. The more you drink, the higher the risk of cancer. Those who suffer facial flushing have a markedly higher risk of esophageal, head, and neck cancer than those who do not [1,7]. An effective way to reduce alcohol consumption is to plan self-designated alcohol-free days every week and stick to your plan [5].

*The percentage of alcohol for each alcoholic drink is measured by volume (ABV).

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Contributing associations and organizations:

» Korean Society of Cancer Prevention (KSCP)

Korean Society of ALDH

Contributing experts:

» Jongsung Kim, Department of Family Medicine, Chungnam National University Hospital

Hee Man Kim, Department of Gastroenterology, Yonsei University Wonju College of Medicine, Yonsei University and Wonju Severance Christian Hospital

Yu Jin Paek, Department of Family Medicine, Hallym University Sacred Heart Hospital

Cheol Min Shin, Department of Internal Medicine, Seoul National University Bundang Hospital

Jung Eun Lee, Department of Food and Nutrition, Seoul National University

Se-Young Choung, Department of Preventive Pharmacy and Toxicology, College of Pharmacy, Kyung Hee University

Ten Guidelines for a Healthy Life

03

Eating a Balanced Diet

Soo Lim, Department of Internal Medicine,
Seoul National University Bundang Hospital
and Seoul National University College of Medicine

A healthy life through a balanced diet in the age of longevity!

03 A healthy life through a balanced diet in the age of longevity!

Eating a Balanced Diet

Summary

◆ **Background**

It is necessary to eat a balanced diet to stay healthy throughout the lifespan.

◆ **Purpose**

To maintain a healthy and balanced diet to prevent the development and progression of chronic diseases.

◆ **Contents**

1. Eat a carbohydrate:protein:fat ratio of 55:20:25

Middle-aged and elderly Koreans over 50 years of age consume a high proportion of carbohydrates as part of their total caloric intake, and those over 65 years of age consume low a proportion of fat as part of the total caloric intake. The Korean Dietary Reference Intake (DRI) recommends 55%-65% carbohydrates, 10%-20% proteins, and 15%-30% fats.

2. Reduce consumption of soda and sugar-sweetened beverages

The recent World Health Organization (WHO) recommendation for added sugar is less than 10% of a person's total daily energy intake (less than 50 g per day). Koreans currently consume 72.1 g of added sugar per day, which is more than the recommended amount. People between the ages of 6 and 29 consume sugar mostly through sodas, and those who are 30 years and older consume sugar mostly through coffee, especially coffee with added sugar.

3. Maintain the recommended caloric intake for a healthy diet

Rapid weight gain increases blood sugar levels and blood pressure, which can lead to diabetes and hypertension, as well as increasing the risk of cardiovascular disease, stroke, and colorectal cancer. In order to help prevent these conditions, people should maintain a healthy weight by avoiding overeating and being physically active starting at a young age.

◆ **Expected impact**

Recently, trends in the Korean diet have favored westernized and unbalanced meals that mainly provide a single nutrient. The purpose of these dietary guidelines is to reduce excessive sugar and bad fat intake and to encourage people to eat a balanced diet that meets the recommended caloric intake, thereby reducing the risk of obesity and obesity-related diseases (cardiovascular disease, stroke, diabetes, and obesity-related cancer). As such, these guidelines aim to promote health for all Koreans in the age of longevity.

◆ Best practices to follow ◆

1. Eat a carbohydrate:protein:fat ratio of 55:20:25
2. Reduce consumption of soda and sugar-sweetened beverages
3. Maintain the recommended caloric intake for a healthy diet

Fact Sheet ❶

Eat a carbohydrate:protein:fat ratio of 55:20:25

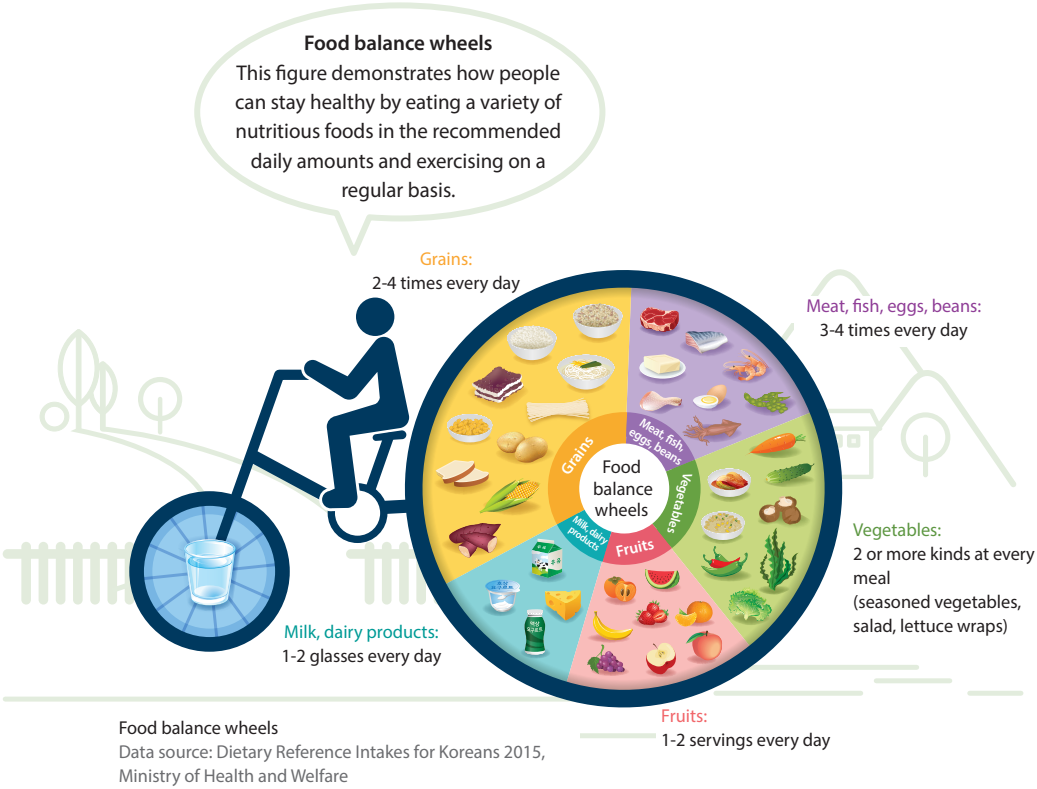
1.1 Consume meals that satisfy the ideal carbohydrate, protein, and fat ratio

A balanced diet following the recommended energy and nutrient intake range is desirable for chronic disease prevention and management. According to the Dietary Reference Intakes (DRI) values for Koreans (a report on recommended energy and nutrient intake for improving health and preventing disease in the Korean population) reported by the Ministry of Health and Welfare and the Korean Nutrition Society, a healthy diet should consist of 55%-65% carbohydrates, 7%-20% protein, and 15%-30% fat (for individuals 3 years old and older) [1,2]. Especially in Korea, the middle-aged and elderly over 50 years old have too high a rate of carbohydrate intake and those over 65 years old have too low a rate of fat intake. These dietary habits underscore the need for a balanced diet [1]. Accordingly, this publication, Ten guidelines for a healthy life: Korean Medical Association statement (2017), proposes a nutrient intake ratio in which carbohydrate intake would be reduced and protein intake would be increased.

The food balance wheels of the Korean DRI (Fig. 3.1) emphasize the importance of a balanced diet, sufficient fluid intake, and regular physical activity for maintaining health. In short, regularly following the recommended caloric intake, consuming a balanced distribution of nutrients, and engaging in an adequate amount of physical activity can prevent obesity and lifestyle-related diseases [2].

Figure 3.1 **Food balance wheels**

(Adapted from Ministry of Health and Welfare and the Korean Nutrition Society [2])



Food balance wheels
Data source: Dietary Reference Intakes for Koreans 2015, Ministry of Health and Welfare

1.2 Avoid diet plans which are not supported by scientific evidence, such as the low-carb high-fat diet

People have shown great interest in the low-carb high-fat (LCHF) diet, which was recently introduced and promoted in newspapers and media as having excellent weight loss results. However, this trend has caused controversy and led to a shortage of butter and increased consumer consumption of pork belly in Korea. The LCHF diet reduces carbohydrate intake to 5%-10% of the recommended total caloric intake, while increasing fat intake to 70% or more. This diet plan is too extreme and is an abnormal way to eat [3].

The purported effectiveness of this extreme form of LCHF diet that spread throughout media outlets everywhere has not clearly been proven. Moreover, health problems can occur if a person follows this diet for a prolonged period. For example, excessive intake of food products high in fat, especially saturated fat, can increase the levels of low-density lipoprotein (LDL) cholesterol (bad cholesterol) in the blood, thereby increasing the risk of cardiovascular disease. When following an abnormally high-fat diet, it becomes difficult to consume an appropriate variety of foods, resulting in an imbalance of micronutrients and decreased fiber intake, which in turn changes the intestinal microbial flora in ways that cause oxidative stress and an increased inflammatory response. Extreme restriction of carbohydrates, meanwhile, increases ketone body synthesis, which negatively affects muscles and bones and reduces glucose levels, causing side effects such as decline in concentration [3].

1.3 Patients with diabetes, hypertension, or cardiovascular disease need to discuss their diet with a physician

Patients being treated for diabetes, hypertension, and cardiovascular disease need to pay extra attention to their dietary choices. Single-nutrient diets such as the LCHF diet can have harmful effects on disease management in patients with uncontrolled diabetes or with heart or kidney problems. Furthermore, if a patient taking diabetes medication suddenly reduces his or her carbohydrate intake, it may cause hypoglycemia, or even worse, ketosis. These diseases could also be exacerbated if the blood LDL cholesterol level increases due to a LCHF diet. Thus, the ground rule is to have these patients maintain a balanced diet as part of an individually customized diet therapy plan that has been discussed with their physicians [3].

1.4 Consume balanced meals with various foods

Consuming a diet with balanced nutrient intake is not only necessary to prevent and manage chronic diseases, but also essential for children and adolescents in order to ensure their healthy development. It is crucial to eat an appropriate—neither excessive nor deficient—amount from each food group. For this reason, the Ministry of Health and Welfare recently announced dietary guidelines to help manage obesity, hypertension, and dyslipidemia in Korea. The guidelines suggest eating balanced meals, including a variety of foods such as rice, grains, vegetables, fruits, milk and other dairy products, meats, fish, eggs, and beans [1].

According to the Korea National Health and Nutrition Examination Survey, calcium intake, the main source of which is milk or dairy products, continues to be insufficient, with individuals consuming only two-thirds of the current 2015 recommended intake amount.

More serious intake deficiencies were prevalent in people with lower socioeconomic status, suggesting that more attention should be paid to this demographic. In contrast, the amount of sodium intake was 2.2 times higher than the recommended daily allowance (2,000 mg) in men and 1.6 times higher in women. It is estimated that 4 out of 5 people consume more sodium than recommended. An additional investigation of the intake of various food groups revealed that, until 2014, individuals' daily intake of grains gradually decreased, while daily meat consumption rose steadily. Vegetable and fruit intake, in comparison, was still inadequate, with only 38.3% of people eating more than 500 g of vegetables and fruits daily (based on data from 2014). This percentage was even lower in people with lower socioeconomic status, meaning that a systematic investigation is needed [1,4].

Regarding the excessive or insufficient intake of various nutrients and food groups in Korea, consumption practices on the individual level should be changed first; in addition, strategies for improving nutrition management are needed and can be developed using dietary policies that support the centralized management of nutrients and food groups. The Health Plan 2020 (2016-2020) set the nutrition-specific objective of increasing the percentage of the population with healthy dietary habits, including the consumption of appropriate amounts of dietary fat and sodium, fruits and vegetables, calcium, and vitamin A, and the outcomes of this strategy are eagerly anticipated [5].

Fact Sheet ❷

Reduce consumption of soda and sugar-sweetened beverages

Recently, the WHO recommended that added sugar should account for less than 10% of total daily energy intake, and that the intake level should be lower than 5% in some circumstances, depending on the conditions of member states. As the recommended daily caloric intake of an average adult is 2,000 kcal, the daily amount of added sugar recommended by the WHO is estimated to be 50 g or less. Based on these guidelines, Korea recommends that the total sugar intake should be 10%-20% of the total daily energy intake, and that added sugar should be less than 10% (Fig. 3.2) [2]. Added sugars are monosaccharides, disaccharides, and

Figure 3.2 **Daily intake recommendations for adults** (Adapted from WHO [6], Ministry of Health and Welfare and the Korean Nutrition Society [2])

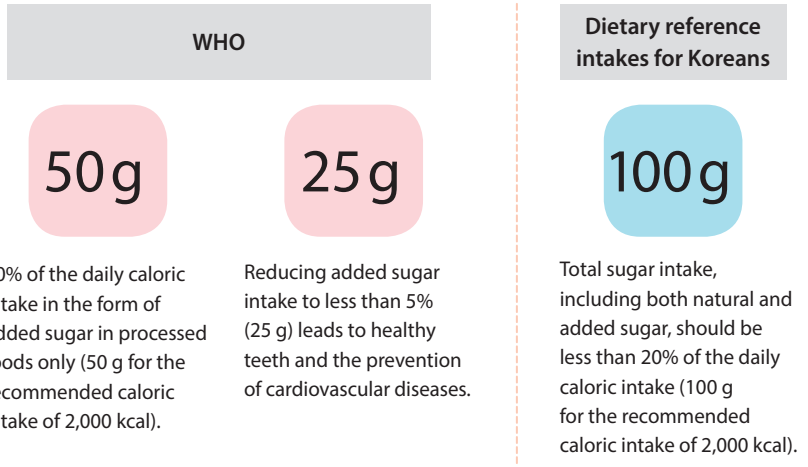
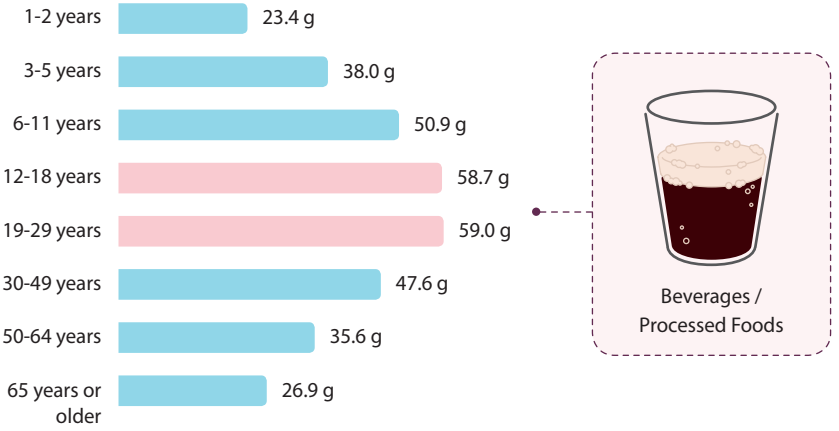
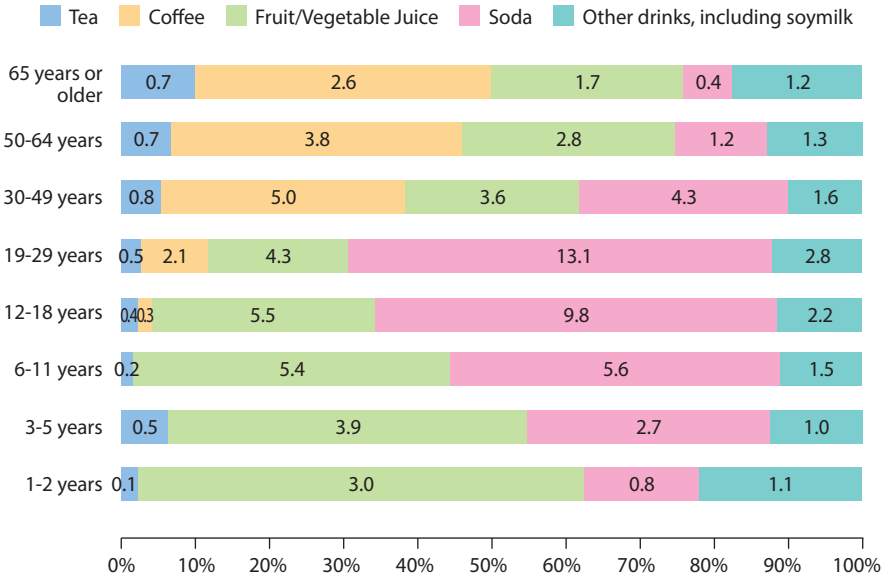


Figure 3.3 **(Top) Amount of sugar intake through processed foods by age group** (Adapted from Ministry of Food and Drug Safety [7])

(Bottom) Distribution of main sources of sugar in beverages (Adapted from Ministry of Food and Drug Safety [7])





syrups that are added to foods when they are processed or prepared. The main sources of added sugar are sugar, high-fructose corn syrup, starch syrup, molasses, honey, syrup, and fruit juice concentrate (Fig. 3.3).

The Ministry of Food and Drug Safety reported that the total sugar intake for Koreans was 72.1 g (less than 20% of the recommended daily caloric intake for a 2,000 kcal diet), which is currently not a level of huge concern; however, there was a 3.5% yearly average increase between 2007 to 2013, and the amount of sugar intake from processed foods is currently 44.7 g (2013), reflecting a yearly average increase of 5.8% compared to 2007 [1]. Accordingly, the Ministry of Food and Drug Safety has proposed sugar-related recommendations, such as "Eat less sugar" and "Drink plenty of water instead of sweetened drinks"

Figure 3.4 **Drink plenty of water instead of sweetened drinks.**

Amount of daily sugar intake through beverages: 8.7 g (2007) ➡ 13.9 g (2013)

(Fig. 3.4) [1]. Considering the increase in sugar intake, along with the rapid increase in beverage consumption, it is time to take preemptive and systematic actions to encourage appropriate levels of sugar intake by encouraging Koreans to change their dietary habits. Additionally, according to an investigation conducted by the Ministry of Food and Drug Safety, people between the ages of 3-29 years old exceeded the recommended amount of sugar intake through processed foods in 2013, and the number of people from other age groups who exceeded this amount was on the rise. Presumably, added sugar intake through beverages or processed food was the cause for this increase. Those ages 6 and older mostly consumed sugar from processed foods through beverages. The investigation reported that 1- to 5-year-olds mostly consumed sugar through fruit and vegetable juices, 6- to 29-year-olds through soda, and those 30 years old and over through coffee, especially coffee with added sugar, such as coffee mixes and canned coffee [1]. Sugar-sweetened beverages are quite diverse, including drinks such as soda, vitamin drinks, energy drinks, and coffee, and these drinks account for a large part of the daily sugar intake of teenagers. Teenagers have a particularly high sugar intake compared to other age groups; therefore, continuous monitoring and management of their sugar consumption are necessary. We need to provide consumer education to raise awareness of the significant amounts of added sugar present in children's food, such as juice, processed milk such as chocolate milk, yogurt, and snacks.

Fact Sheet ❸

Maintain the recommended caloric intake for a healthy diet

3.1 Keep watching your weight

The prevalence of adult obesity in Korea in 2015 is 2 in 5 men and 1 in 4 women, as defined by a body mass index (BMI) of 25 kg/m^2 or higher. For women, statistics show that the rate is higher in people with lower socioeconomic status [8]. Obesity has a strong association with cardiovascular disease and stroke, which increases the risk of mortality, as well as with other causes of death, including cancer. Therefore, obesity should be regarded as an important public health and socioeconomic issue. In particular, abdominal fat accumulation is associated with glucose intolerance, and increased body fat reduces insulin sensitivity. Furthermore, the fact that hypertension is more common in centrally obese people than peripherally obese people indicates that the distribution of body fat is more important than simply measuring obesity. Abdominal obesity is associated with higher serum triglyceride and LDL cholesterol levels, lower high-density lipoprotein (HDL) cholesterol levels, and a higher frequency of accompanying hyperinsulinemia [9].

The rapid increase in obesity rates in Korea was caused by the shift to westernized dietary habits and decreased physical activity due to advances in transportation methods. These causes led to an imbalance between energy intake and metabolism, which ultimately caused a rapid increase in obesity, cardiovascular disease, diabetes, and obesity-related cancer (for example, colorectal cancer). Therefore, in order to reduce

the obesity rate, national education programs and government policies that encourage people to consistently maintain the recommended caloric intake and to increase their physical activity level are vital [10]. According to the 2014 Korea Health Statistics, the energy intake rate steadily increased starting in 2004, while the walking rate gradually decreased, meaning that an action plan is needed [4]. Additionally, being aware of one's own weight and examining one's own behaviors related to obesity can help fight obesity [11].

3.2 Maintain a healthy weight from childhood onward

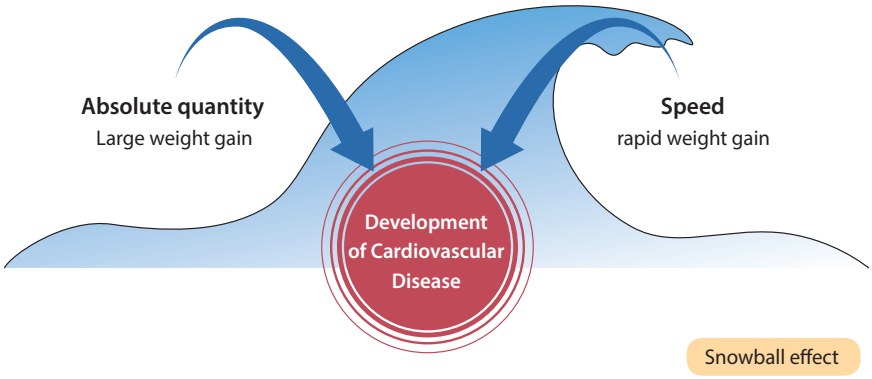
Obesity is the main factor that causes metabolic syndrome, which is a common health issue. When children and teenagers have metabolic syndrome, they are likely to develop diabetes, hyperlipidemia, and cardiovascular disease. Since these diseases require long-term treatment and management, they can lead to other health concerns and increased medical expenditures. Therefore, the increase of metabolic syndrome in teenagers could become a critical public health and socioeconomic issue affecting the future of Korea. In particular, among the 5 components of metabolic syndrome (high glucose, high blood pressure, high triglycerides, low HDL cholesterol, and abdominal obesity), there was a decrease in HDL cholesterol levels (10.5%) and increases in triglyceride levels (6.2%) and abdominal obesity (2.9%), which indicates that the lack of physical activity and excessive nutrient intake can be considered the main causes of the increase in metabolic syndrome among children and teenagers [12]. In fact, it is important to note that over the past 10 years, Korean teenagers have been engaging in less exercise and consuming more fat [1].

A comparative analysis of national health and nutrition examination survey data from the U.S. and Korea in the past 10 years showed a decrease in the prevalence of metabolic syndrome among teenagers in the U.S., while the rate doubled for Korean teenagers [12]. If the prevalence of metabolic syndrome among Korean teenagers continues to rise, it is predicted that metabolic syndrome will increase by 0.4% every year, resulting in 22,000 new cases annually among teenagers. In order to prevent this, schools and households should provide balanced meals, increase the number of physical education classes, and provide after-school programs that allow teenagers to voluntarily engage in more physical activity, all of which require parents to change their perceptions of their children's health and for a different governmental policy approach to be implemented [13].

3.3 Slow down weight gain when overweight or obese

According to a recent study, the larger and faster the weight gain compared to one's weight at the age of 20, the higher the risk of developing cardiovascular disease (Fig. 3.5). Thus, attention should also be paid to obesity early in life and to the rate and speed of weight gain [14]. Rapid weight gain causes insulin resistance, increases inflammatory responses, and raises blood sugar and blood pressure, fundamentally damaging intravascular endothelial cells, which could cause coronary artery disease. In other words, the snowball effect of rapid and significant weight gain increases the risks of cardiovascular disease; therefore, it is important for people in their 20s and 30s to control their weight.

Figure 3.5 **Conditions of weight gain and risks of cardiovascular disease: the snowball effect** (Modified from Medical Observer [15])



Currently, the prevalence of diabetes and cardiovascular disease is continuously increasing in Korea. This could lead to major issues on the individual and social levels. It is important to implement preventive strategies, such as reducing westernized, high-fat, and high-calorie dietary habits, increasing physical activity, and maintaining a healthy weight early in life. Unless behavioral changes are made regarding westernized dietary habits and decreased physical activity, medical costs will rise.

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Contributing associations and organizations:

» The Korean Academy of Family Medicine

Korean Endocrine Society (KES)

Korean Diabetes Association (KDA)

Korean Society for Study of Obesity (KSSO)

The Korean Society of Pediatric Gastroenterology, Hepatology and Nutrition (KSPGHAN)

The Korean Society of Gastroenterology

Korean Society of Cancer Prevention (KSCP)

The Korean Nutrition Society

Contributing experts:

» Yu Jin Paek, Department of Family Medicine, Hallym University Sacred Heart Hospital

Mi-Kyung Sung, Department of Food and Nutrition, Sookmyung Women's University

Hye Ran Yang, Department of Pediatrics, Seoul National University Bundang Hospital

Jung Eun Lee, Department of Food and Nutrition, Seoul National University

Ten Guidelines for a Healthy Life

04 Being Physically Active

Jun Soo Kwon, Department of Psychiatry,
Seoul National University Hospital

Saejong Park, Korea Institute of Sports Science

Take care of your body by physically active lifestyle every day!

04 Take care of your body by physically active lifestyle every day!

Being Physically Active

Summary

◆ **Background**

The physical inactivity of modern life is a risk factor for major physical illnesses.

◆ **Purpose**

These guidelines suggest physical activities and exercises that you can easily engage in as part of everyday life to improve your physical and mental health.

◆ **Contents**

1. Add physical activity to your daily routine!

It is not easy for busy modern people to find the extra time to exercise. Incorporating more physical activity into your daily routine—on your way to work, while doing housework, or during leisure time—will enhance your physical health and mood.

2. Get up and move every 2 hours

People who watch TV for more than 2 hours a day have a higher risk of diabetes and cardiovascular disease than those who do not. Therefore, in order to reap the benefits of a physically active lifestyle, it is important to avoid sitting too long.

3. The basic principle of weekly exercise: Do at least 150 minutes of brisk walking a week and perform muscle-strengthening activities on more than 2 days a week

For physical and mental health, it is important to engage in more than 150 minutes of moderate-intensity aerobic activity, or more than 75 minutes of vigorous aerobic activity. It is also important to engage in muscle-strengthening activities that involve all major groups on more than 2 days a week.

◆ **Expected impact**

Regular exercise reduces the risk of chronic disease, improves your health, and positively influences your mood and quality of life. Moreover, participation in community and interaction with other people through regular exercise is beneficial for society.

Best practices to follow

1. Add physical activity to your daily routine!
2. Get up and move every 2 hours
3. The basic principle of weekly exercise: Do at least 150 minutes of brisk walking a week and perform muscle-strengthening activities on more than 2 days a week

As society has become industrialized, the proportion of indoor office work has significantly increased. Thus, sedentary lifestyles have become increasingly widespread, and physical inactivity has emerged as a new health problem. According to the World Health Organization, physical inactivity is a common problem in the world, and is one of the 4 major risk factors for death, along with high blood pressure, smoking, and hyperglycemia [1].

Physical inactivity is a major emerging cause of cardiovascular disease, diabetes, and cancer, as well as a risk factor for hypertension, hyperglycemia, and obesity throughout the world [1]. Physical inactivity is estimated to be a main cause of 21%-25% of cases of breast and colon cancer, 27% of cases of diabetes, and 30% of cases of ischemic heart disease [1]. Regular exercise can improve cardiorespiratory fitness and muscle endurance, which is important because muscle strength is known to be an independent factor that reduces the prevalence of cardiovascular disease, diabetes, metabolic syndrome, and cancers, as well as mortality due to these conditions [2-7].

Physical activity is a major contributing factor to total energy expenditure. It is essential for energy balance and weight control. Engaging in aerobic exercise for 150 minutes or more per week over 12 months has been shown to result in weight reduction of 1%-3%; this is the amount of exercise needed to maintain an appropriate body weight [8]. Maintaining a healthy body weight or losing weight (if appropriate) reduces the risk of metabolic diseases, including diabetes, and the risk of death. There is an inverse relationship between maintaining a healthy body weight and the mortality rate, whether one is of normal weight, overweight, or obese [9]. Moreover, in a study of the relationship between cardiorespiratory fitness and metabolic diseases conducted among 1,007 adults who underwent health checkups, those who were more obese and had lower levels of cardiorespiratory fitness showed a risk of metabolic diseases from 8.1 to 18.8 times higher than that of their counterpart [10].

Regular exercise is not only beneficial for preventing osteoporosis and improving bone health, but also can reduce negative moods and help alleviate conditions such as depression or anxiety. Furthermore, it increases positive moods and self-esteem, and positively affects quality of life. Additionally, participating in physical activity may lead to opportunities for socialization, networking, and the development of one's cultural identity. Physical activity has a positive influence on the community and society by promoting social interaction and cohesion [11,12].

Fact Sheet ❶

Add physical activity to your daily routine!

1.1 Incorporate physical activity into your daily routine at home, school, and work

It is not easy for busy modern people to find the extra time to work out. Therefore, many exercise guidelines recommend being physically active as part of your everyday life, in environments such as at home, school, and work [2,8]. For example, instead of sitting or lying down at home, you can work out by moving your body, doing household chores such as cleaning or taking out the garbage, and walking while watching TV. In other words, you need to move as much as possible while at home, by reducing the time you spend sitting or lying down in one position to watch TV or to use the computer, a smartphone, or mobile gadgets. Moreover, when grocery shopping, instead of using a shopping cart, using a grocery basket will allow you to use your muscles more and increase your activity level. At work, by performing stretching intermittently to relax your muscles and by using stairs instead of elevators or escalators, you can increase your physical activity level.

1.2 Exercise during commuting and leisure time

You can engage in more exercise and physical activity by taking advantage of the time you spend commuting. By walking short distances, using public transportation instead of driving, and getting off a couple of stops earlier than your destination from the bus or subway to walk to your destination, you can increase your physical activity level. Riding a bicycle or walking fast to get to work or school is also a good

way to boost the amount of exercise you do without taking extra time for workouts. Moreover, taking advantage of leisure time to play sports and games can be healthy and fun at the same time.

Fact Sheet ❷

Get up and move every 2 hours

2.1 Move more to help your brain process information

Those who watch 2 or more hours of TV a day have a 15% and 20% higher chance of developing cardiovascular disease and diabetes, respectively, and a 13% higher mortality rate [13]. Additionally, another study has shown that those who spend more time sitting have higher risk of mortality than those who do not, regardless of their physical activity level [14]. Therefore, in order to reap the benefits of a physically active lifestyle, it is important to avoid sitting too long.

Fact Sheet ❸

The basic principle of weekly exercise: Do at least 150 minutes of brisk walking a week and perform muscle-strengthening activities on more than 2 days a week

3.1 For physical and mental health, it is important to engage in more than 150 minutes of moderate-intensity aerobic activity, or more than 75 minutes of vigorous aerobic activity

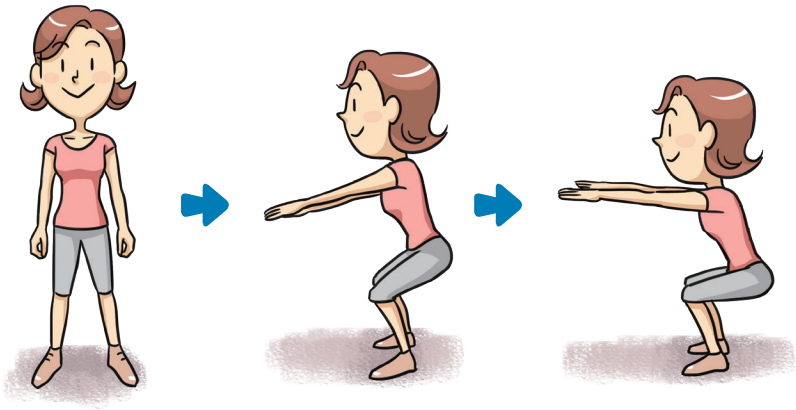
Aerobic activity (also called cardiorespiratory or endurance activity) is defined as rhythmic patterns of large muscle contraction carried out for a sustained time. Walking, jogging, bicycling, aerobics, aqua aerobics, swimming, and hiking are examples. Within the diverse range of aerobic activities, choosing one that is right for your level of physical fitness and cardiorespiratory function is important. It is important to begin with low-intensity exercise and gradually increase the intensity and duration of your workouts. In particular, it is safe for beginners to start with exercise that is not burdensome, such as walking.

Moderate intensity: For those who are not used to exercise

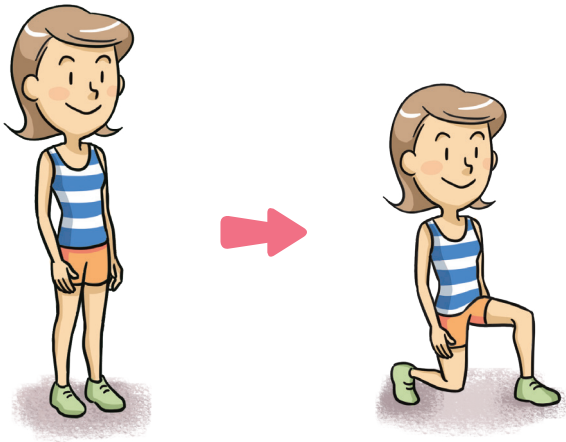
Brisk walking, riding a bicycle (at a regular speed), climbing stairs, slow dancing, playing badminton, and hiking up a low hill

Vigorous intensity: For those who have above-average physical fitness and workout skills

Running, riding a bicycle (at a fast speed), inline/ice skating, jumping rope, fast dancing, swimming, and hiking up a steep mountain



Squat position



Lunge position

The American Heart Association recommends more than 150 minutes of moderate-intensity exercise, or more than 75 minutes of high-intensity exercise weekly for adults [15]. However, people with cardiovascular disease or diabetes should engage in exercise following individualized suggestions from a medical professional, due to risks of increased blood pressure or low blood sugar.

3.2 Engage in muscle-strengthening activities that involve all major groups on more than 2 days a week

Muscle-strengthening activities put a load (weight) on the muscle. Increasing the load helps to strengthen the muscles. Examples of muscle-strengthening activities include resistance training and lifting weights. The combination of aerobic exercise and weight training is known to improve blood sugar levels to a remarkable extent. When muscle volume is increased by weight training, the amount of glucose consumed by the muscle also increases, which is how such forms of exercise help to control blood sugar levels. Moreover, increased muscle boosts the basal metabolic rate. This allows the body to burn more calories and is effective in treating overweight or obesity. Higher metabolic rates also help to maintain proper weight. Types of weight training include push-ups, squats, and lunges. You can do weight training by using dumbbells or machines.

Physical activity guidelines for Koreans

▶ Children and adolescents (5-17 years old)

Do more than 1 hour of physical activity daily. Engage in either moderate or vigorous aerobic activity for more than 1 hour a day. Include vigorous aerobic activity at least 3 days a week.

As part of the hour of daily physical activity, include muscle-strengthening activities on at least 3 days of the week. Muscle-strengthening activities for children include jungle gym and monkey bar activities.

▶ Adults (18-64 years old)

Do at least 150 minutes of moderate-intensity aerobic activity per week, or more than 75 minutes of vigorous aerobic activity. One minute of vigorous activity is equal to 2 minutes of moderate-intensity activity. Set a goal of combining moderate-intensity and vigorous activities in your workout routine. Each round of activity should last at least 10 minutes.

Do resistance exercises on more than 2 days a week, involving major muscle groups of the body. Repeat each exercise 8 to 12 times per set. After working out, let each body part that you exercise rest for 1 or 2 days before you focus on it again. If the exercise becomes easy, add more weight or repeat the exercise 2 or 3 more times in each set. Muscle

training includes weight-bearing exercises (e.g., sit-ups, push-ups, and climbing stairs) and exercise using equipment (e.g., dumbbells or stretch bands).

▶ Adults older than 65 years old

Do at least 150 minutes of moderate-intensity aerobic activity per week, or more than 75 minutes of vigorous aerobic activity. One minute of vigorous activity is equal to 2 minutes of moderate-intensity activity. Set a goal of combining moderate-intensity and vigorous activities in your workout routine. Each round of activity should last at least 10 minutes. It is recommended to split the weekly amount of exercise over several days. In case you do not engage in the recommended amount of exercise, it is advisable that you exercise as much as your physical fitness level allows, rather than not exercising at all or exercising excessively.

To maintain your health and physical independence, it is important to engage in exercises that help maintain or improve your muscular strength and muscular endurance. Do weight training more than 2 days a week, involving every major body part. Do 8 to 10 types of exercises

and repeat 10 to 12 times per set. If the exercises are too strenuous, reduce the weight and increase the number of sets [16]. After working out, let each body part that you exercise rest for 1 or 2 days before you focus on it again. Examples of muscle training include weight-bearing exercises (e.g., sit-ups and push-ups) and exercise using equipment (e.g., dumbbells or stretch bands).

In particular, to improve balance and to prevent falls, do balance training—more than 3 days per week—as the level of your physical fitness allows. Examples of balance training include tai chi, walking sideways, walking on your heels, walking on your toes, and sitting down and standing up. You can increase the level of difficulty of this type of exercise. First, start your workout by holding on to a fixed supporting structure. Then, try to exercise without the support.

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Contributing organizations and associations:

» Korea Institute of Sport Science, Korea Sports Promotion Foundation

Korean Neuropsychiatric Association (KNPA)

Ten Guidelines for a Healthy Life

05

Having a Regular Sleep Schedule

Yu Jin Lee, Department of Neuropsychiatry,
Seoul National University Hospital

Jun Soo Kwon, Department of Psychiatry,
Seoul National University Hospital

Remember:
Sound and regular sleep leads to a healthy life

05 Remember: Sound and regular sleep leads to a healthy life

Having a Regular Sleep Schedule

Summary

◆ Background

Healthy sleep is an indispensable part of physical and mental health. Maintaining sleep hygiene is essential for sound sleep.

◆ Purpose

To present the key guidelines for sleep hygiene.

◆ Contents

1. Maintain a regular wake-up time and if necessary, take a nap for less than 30 minutes

Waking up at a regular time allows a regular sleep cycle to be maintained, which ensures sound sleep. Additionally, taking a nap for over 30 minutes is not recommended, as doing so can affect nighttime sleep.

2. Get enough sleep

In the short term, insufficient sleep can affect one's judgment, mood, and ability to acquire and retain information, as well as increasing the risk of serious accidents and bodily harm resulting from drowsiness. Sleep duration can vary across individuals; however, getting enough sleep, in accordance with one's age, is good for concentration and mental health.

3. Thumbs up for regular daytime exercise! Thumbs down for caffeine, alcohol, and tobacco!

Daytime exercise improves the overall duration and quality of sleep by stabilizing circadian rhythms. Intake of caffeine, alcohol, and nicotine reduces the quality of sleep.

◆ Expected impact

By offering key guidelines for sleep hygiene, sleep health is expected to be ameliorated, as one's physical and mental health can be promoted by getting good quality sleep.

◆ Best practices to follow ◆

1. Maintain a regular wake-up time and if necessary, take a nap for less than 30 minutes
2. Get enough sleep
3. Thumbs up for regular daytime exercise! Thumbs down for caffeine, alcohol, and tobacco!

Fact Sheet ❶

Maintain a regular wake-up time and if necessary, take a nap for less than 30 minutes

Our body has a 'biological clock' that controls our sleeping and waking functions 24 hours a day. Keeping one's eyes closed or lying down too much during the daytime disrupts this biological clock, resulting in sleepless nights when sleep is most needed [1-3]. Additionally, remaining in bed when one does not feel drowsy might cause the habituation (or conditioning) of insomnia, which means that our body gets accustomed to the state of arousal in bed.

1.1 Wake up at a regular time

Making it a rule to wake up at a regular time helps to maintain the sleep cycle and to ensure sound sleep. No matter what time you fell asleep the previous night, no matter how

refreshed you feel, you need to wake up at a regular time every morning. Setting a daily alarm for certain times in the morning can help.

1.2 Go to bed only when you feel sleepy; if not sleepy, get out of bed

Going to bed only when you feel sleepy helps you sleep, because that way you fall asleep faster and wake up less often [1].

If you cannot fall asleep even long after getting into bed, getting out of bed and waiting until you become sleepy is much more helpful. You might not have slept well the previous night, which could easily trick you into thinking that you need to go to bed earlier because you are tired. However, it is important to wait until your body sends you a signal that you are sleepy. You fall asleep instantly when you go to bed drowsy, which reinforces the association between bed and sleep and helps your future sleep. Forcing yourself into bed when you do not feel sleepy will only exacerbate the problem; thoughts of things that happened during the day, worries, and various stray thoughts will keep you from physical and mental relaxation, awakening you all the more.

1.3 Do not take long naps

Taking a nap for over 30 minutes is not recommended, as it can affect nighttime sleep.

Naps disrupt the sleep-wake cycle, thereby disrupting sleep at night. Lying down too often during the day disturbs our 'biological clock,' which makes it hard for our body to feel the need to

sleep at night. In fact, not only actual sleeping, but mere lying down with our eyes closed can confuse our biological clock, which easily mistakes this for proper sleeping. Therefore, one should avoid napping, and naps should be for less than 30 minutes when unavoidable [4,5].

Homeostasis of sleep means that the need for sleep increases in proportion to the time one spends awake during the day; a nap reduces homeostatic sleep drive, so it disturbs nighttime sleep.

Fact Sheet ❷

Get enough sleep

The U.S. National Sleep Foundation has suggested the following age-specific daily sleep duration necessary for physical and mental health:

Newborn (0-3 months)	14-17 hours
Infant (4-11 months)	12-15 hours
Toddler (1-2 years)	11-14 hours
Preschool (3-5 years)	10-13 hours
School age (6-13 years)	9-11 hours
Teens (14-17 years)	8-10 hours
Young adult (18-25 years)	7-9 hours
Adult (26-64 years)	7-9 hours
Older adult (≥65 years)	7-8 hours

(https://sleepfoundation.org)

Sleep performs various functions pivotal to human health, such as improving learning ability and memory, maintaining homeostasis and body temperature, and maintaining proper immune function.

Insufficient sleep in the short term can impair judgment, control over one's emotions, and adversely affect the cognitive information processing. Moreover, drowsiness can increase the risk of serious accidents and injury. In the long term, chronic sleep deprivation can lead to health issues such as obesity, diabetes, cardiovascular disease, and even premature death. In particular, insufficient sleep among teenagers is associated with depression and suicide, according to a previous study in Korea [6].

Fact Sheet ❸

Thumbs up for regular daytime exercise! Thumbs down for caffeine, alcohol, and tobacco!

3.1 Regular daytime exercise helps to increase deep sleep and total sleep duration

In studies assessing sleep, daytime exercise and sleep hygiene have been reported to have beneficial effects, such as increasing the quality, duration, and efficiency of sleep, as well as alleviating daytime dysfunction [7].

However, care should be taken regarding exercise just before bedtime. It can excite our body and mind, prolonging the time it takes to fall asleep (Fig 5.1) [8].

It was found that 16 weeks of moderate level exercise during daytime resulted in decreased sleep latency, increased total sleep duration, alleviated depression, and improved quality of sleep and life (Table 5.1).

Figure 5.1 **Exercise and sleep time** (Modified from Reid KJ et al [9])

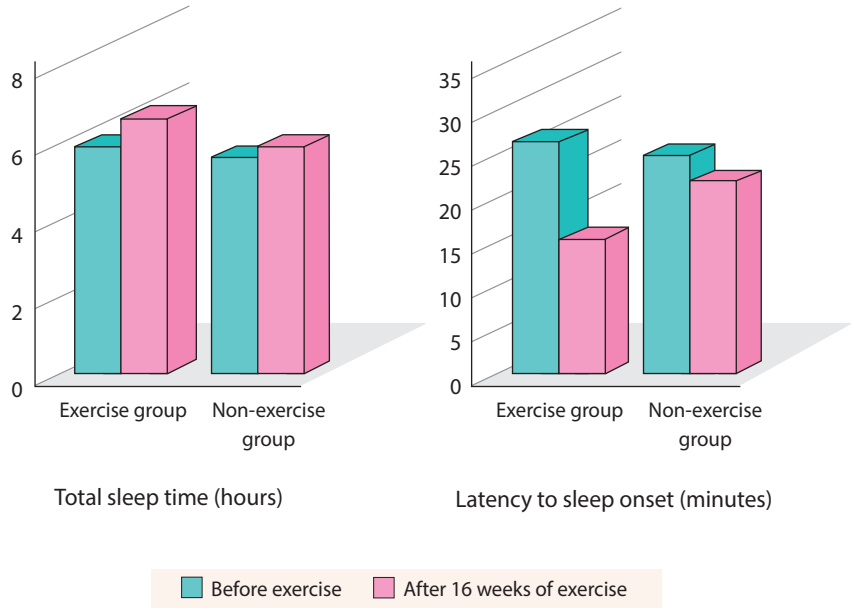


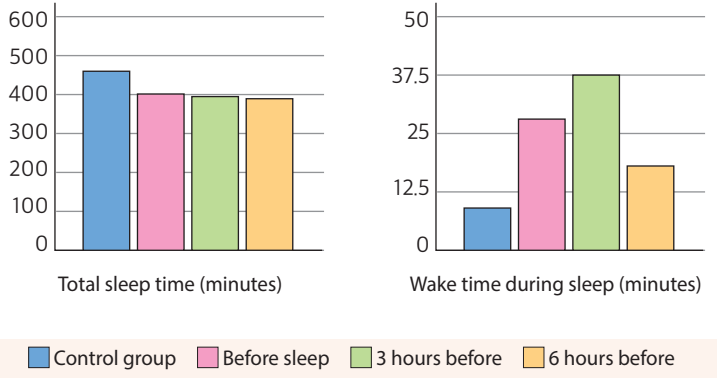
Table 5.1 **Effects of exercise on sleep quality, depression, and quality of life** (Modified from Reid KJ et al [9])

	Exercise group	Non-exercise group
Sleep quality appraisal	Improved	No change
Depression	Improved	No change
Life quality appraisal	Improved	No change

3.2 Consumption of caffeine may worsen the quality of sleep

Consumption of caffeine before bedtime leads to decreased sleep duration, increased latency to sleep onset, and decreased deep sleep [10,11]. Caffeine consumption both 3 and 6 hours before bedtime equally reduced the total sleep time and increased the wake time during sleep (Fig 5.2) [12]. To improve the quality of sleep, caffeinated products such as coffee and green tea are to be avoided.

Figure 5.2 **Caffeine consumption and sleep**
(Modified from Drake C et al [12])



3.3 Smoking reduces the quality of sleep

It tends to take more time for smokers to fall asleep, and they are also likely to wake up earlier than non-smokers. Additionally, smoking can reduce sleep quality, as it is a risk factor for sleep disordered breathing during sleep.

3.4 Drinking alcohol reduces sleep quality

The sedative effects of alcohol make one fall asleep fast, but alcohol reduces the overall quality of sleep, renders one prone to fitful sleep, and makes returning to sleep difficult once awakened [13].

Drinking sometimes helps one to fall asleep faster, but continuous drinking disturbs the state of sleep and makes one wake up often while in bed. A previous study reported that acute high-dose drinking or chronic drinking could decrease sleep latency, but disturb sleep continuity and decrease total sleep duration [14].

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Contributing organizations and associations:

» The Korean Academy of Sleep Medicine (KASMED)

Korean Neuropsychiatric Association (KNPA)

Ten Guidelines for a Healthy Life

06

Thinking Positively

Jun Soo Kwon, Department of Psychiatry,
Seoul National University Hospital

Jeong-Ho Chae, Department of Psychiatry,
Seoul St. Mary's Hospital and The Catholic University of Korea

Yu Jin Lee, Department of Neuropsychiatry,
Seoul National University Hospital

Appreciate the little things and be happy with your loved ones!

06 Appreciate the little things and be happy with your loved ones!

Thinking Positively

Summary

◆ Background

Making a habit of appreciating the little things in daily life and cultivating good relationships with the people around you can improve the quality of your life as well as other people's lives.

◆ Purpose

To promote happy and healthy lives by providing everyday guidelines on thinking positively, showing gratitude, and cultivating good relationships.

◆ Contents

1. Appreciate the little things

Research shows that people who appreciate the little things in life experience positive emotions more often and are happier and livelier than those who do not. You can see how a small change makes a big difference by making time to think about a good thing that happened to you today, no matter how small. Savor it for a moment, capture it in a photo, or write about it.

2. Stop comparing yourself to others, and be happy with yourself

Comparing yourself to others whenever you face a life crisis may give rise to an inferiority complex; instead, you can overcome adversity and build confidence by focusing on getting stronger every day.

3. Remember that happiness starts from good relationships! Empathy + communication + compassion!

It is desirable to try to spend time with people who are fun to be with and who share your hobbies, as well as to maintain good relationships with those around you. People with good relationships are not only physically healthier and experience more happiness, but also tolerate stress better when they face unexpected adversities or stressors.

◆ Expected impact

Appreciating the little things and making a habit of expressing your emotions can enable you to find strength and enjoy a healthy life by maintaining good and pleasant relationships.

◆ Best practices to follow ◆

1. Appreciate the little things
2. Stop comparing yourself to others, and be happy with yourself
3. Remember that happiness starts from good relationships! Empathy + communication + compassion!

Martin Seligman, a psychologist specializing in positive psychology, proposed that an individual can live a happy and meaningful life by increasing positive emotions and living together with others [1]. Positive emotions expand one's breadth of thinking, while also improving concentration, creative thinking, physical activity, and relationships with others. Furthermore, positive emotions neutralize negative emotions; hence, they improve physical health by reducing the physical tension that accompanies negative emotions. Positive emotions are experienced through activities rather than through thinking; in particular, they are induced by interacting positively with people and engaging in energetic physical exercise. People with strong, deeply-rooted positive emotions are active socially, mentally, and physically, and such emotions are helpful for mental and physical health.

Fact Sheet 1

Appreciate the little things

1.1 Let's start by asking a simple question, "What is going well for me now?"

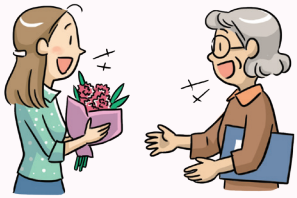
According to positive psychologist Barbara Fredrickson, the questions that we ask ourselves have a special power [2]. What is a good thing about the place where I am at now? What helped me get here? What can be considered a valuable gift around me? How does it benefit me and others?

The first step to positive thinking is to acknowledge the good things that happen in your daily life. At the end of the day, if you can reflect on the good things that happened to you that day, savor them, and then write about them with gratitude, it can lead to tremendous changes.

1.2 If you feel good and grateful, it is best to express it in your own way

Appreciation induces positive emotions that help open one's mind and repay the kindness of others. When you feel appreciation, it is important to express gratitude in your own way.

Research has demonstrated that people who regularly express gratitude are happier and livelier, and also experience hopeful and positive emotions more often [3]. Finding and expressing gratitude can lead to not only positive thinking, which refers to acceptance of one's present life as it is, but also has the advantageous effect of helping to develop solid relationships with the people around you. Take a small step, such as getting in touch with people for whom you have gratitude and expressing your appreciation. Consider engaging in the following activities by integrating the key practices of positive psychology articulated by Martin Seligman [1].



Gratitude visit
Visit, call, or send an email or text message to someone you've always felt grateful to but haven't expressed that gratitude to.

Three good things in life
At the end of the day, recall three things that went well that day and write down why they went well. Go further by trying to find reasons for good things whenever they happen.

You at your best
Recall the happiest or the most pleasant moment of the day and write down your strength that was discovered at that moment.

Fact Sheet ❷

Stop comparing yourself to others, and be happy with yourself

2.1 I made it through today, and I am better than I was yesterday

We tend to focus first on our shortcomings or mistakes rather than on good things. However, if you look carefully at the good things, some wonderful moments must have occurred, such as being more careful or humble, having more hope, or showing more kindness to others than usual. The positive personality displayed in those moments is called character strength, and we all have our own unique character strengths.

According to positive psychologist Martin Seligman, "Positive social science assumes that human goodness and excellence are as authentic as disease, disorder, and distress" [1].

People often face difficult and hard tasks, but they will be able to meet the day more happily if they can focus on their unique strengths and how they have progressed, rather than comparing themselves with others. In fact, it has been proven that a positive perspective on life, which includes finding one's own strengths, is something that can be learned through training.

Fact Sheet ❸

Remember that happiness starts from good relationships!
Empathy + communication + compassion!

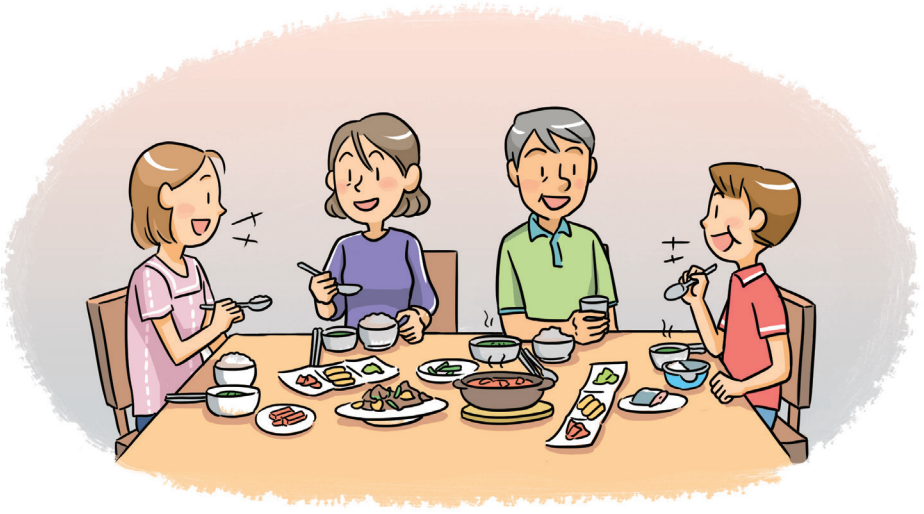
3.1 Have a meal and a pleasant conversation with those close to you as often as possible

According to David G. Myers and Ed Diener, "Happiness grows less from the passive experience of desirable circumstances than from involvement in valued activities and progress toward one's goal" [4]. A life of involvement means maintaining close relationships with others and fully demonstrating one's individual talents to their best. Furthermore, the psychologist Michael W. Fordyce described the following 14 fundamental activities for happiness [5].

1. Spend more time socializing.
2. Strengthen your closest relationships.
3. Develop an outgoing, social personality.
4. Be a better friend.
5. Work on a healthy personality.
6. Lower expectations and aspirations.
7. Develop positive, optimistic thinking.
8. Value happiness.
9. Become more active.
10. Become involved with meaningful work.
11. Get better organized and plan things out.
12. Develop your "present orientation."
13. Reduce negative feelings.
14. Stop worrying.

One of the most basic needs and motivations of humans is having positive relationships with those around them [6]. The feeling of positively 'belonging' with the people around you has a tremendous effect in many ways. Research has shown that people who think positively and cultivate good relationships with the people around them are physically healthier, experience happiness more often, and more easily overcome unexpected adversities or stress [7].

Find time to have a comfortable meal and pleasant conversation with family or acquaintances as often as possible. Although we have busy daily lives, spending part of our limited time with people around us can be a gift.



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Contributing associations:

» Korean Neuropsychiatric Association (KNPA)

Korean Association of Psychoanalysis (KAPA): Study Group and Allied Center of the IPA

Contributing experts:

» Yu Jin Paek, Department of Family Medicine, Hallym University Sacred Heart Hospital

Ten Guidelines for a Healthy Life

07 Receiving Routine Health Screenings and Immunizations

Hyeon Woo Yim, Department of Preventive Medicine, College of Medicine, The Catholic University of Korea

Yeol Kim, Graduate School of Cancer Science and Policy, National Cancer Center

Dongwook Shin, Department of Family Medicine, Samsung Medical Center

Byung Chul Chun, Department of Preventive Medicine, College of Medicine, Korea University

Yong Pil Chong, Department of Infectious Diseases, Asan Medical Center, University of Ulsan College of Medicine

Won-Chul Lee, Department of Preventive Medicine, College of Medicine, The Catholic University of Korea

Health is a habit.
Get screened and immunized while you're healthy!

07 Health is a habit. Get screened and immunized while you're healthy!

Receiving Routine Health Screenings and Immunizations

Summary

◆ Background

It is widely recognized that disease prevention is more important than treatment. Currently, a national health screening program, a national cancer screening program, and a national immunization program constitute the major disease prevention programs in South Korea. Utilizing these programs to their full potential will have a positive impact on disease prevention.

◆ Purpose

In reality, screening rates are still relatively low, and some individuals have misconceptions regarding health screenings, such as the perception that they do not need to return for follow-up appointments, even after a positive result. Hence, accurate information needs to be provided regarding health screenings and immunizations.

◆ Contents

1. Participate in a national health screening program at each stage of the life cycle as part of leading a healthy life

The most health benefits can be obtained by keeping up with the health screenings recommended by the national health screening program, national cancer screening program, and other health screening programs that are provided for each stage of the life cycle, such as those for infants and children, adolescents, and the elderly.

2. Make sure that you receive the results of health screenings and practice the appropriate healthy habits

Follow-up exams should be carried out if positive results are found, and efforts should be made to further improve one's health by making any necessary lifestyle changes, such as quitting smoking, abstaining from alcohol, and exercising. Diseases such as high blood pressure, dyslipidemia, diabetes, and cancer can be caused by smoking, drinking, lack of exercise, improper diet, and obesity. Hence, maintaining healthy habits can prevent a range of diseases.

3. Receive timely immunizations for your own health and that of the community

Immunizations are the most effective way to prevent infectious diseases, and South Korea has a comprehensive national immunization program in place. Receiving immunizations as outlined in the recommendations can simultaneously prevent both epidemics and individual infections through herd immunity.

◆ Expected impact

Following the recommendations of the national health screening program, the national cancer screening program, and the national immunization program reduces the chances of developing diseases (as well as associated mortality), helping citizens to lead long, healthy lives.

Best practices to follow

1. Participate in a national health screening program at each stage of the life cycle as part of leading a healthy life
2. Make sure that you receive the results of health screenings and practice the appropriate healthy habits
3. Receive timely immunizations for your own health and that of the community

Fact Sheet 1

Participate in a national health screening program at each stage of the life cycle as part of leading a healthy life

1.1 Early detection of diseases through health screenings is the shortcut to good health

As implied in the saying "*seng lo byoung sa*" ("birth, aging, sickness, and death: the four phases of life"), disease is a part of life. Although ideal in theory, it is impossible to completely prevent disease by merely taking care of one's health.

Hence, the next best plan is to quickly identify and treat a disease when it occurs without noticeable signs or symptoms, either completely curing the disease or minimizing its complications.

For chronic diseases such as cancer, symptoms do not develop until months or even years after the disease sets in.

The appearance of symptoms of chronic diseases and cancer can indicate that the disease has already progressed significantly. If this is the case, it is best to detect the disease at an early stage.

Screening is designed to reveal whether a patient who appears to be healthy is truly healthy or has a non-apparent disease through selected tests. Fortunately, South Korea has an active national health screening

Table 7.1 **Diseases screened for in the life cycle–based national health screening program and other health screenings**

(Adapted from Ministry of Health and Welfare [1], National Law Information Center [2])

Category	Infancy/Early childhood (0-5 years old) (Infant health screening)		Childhood/adolescence/early adulthood (6-18 years old) (Screening for school-age children) (Life transition period [15 years of age-18 years old] screening)	
Screening intervals	The ages of 4, 9, 18, 30, 42, 54, and 66 months (7 examinations in total)		Grades 1-4, 7, and 9 (4 screenings total). For students who do not attend school, between the ages of 15 and 18.	
Target illnesses and screening items	Basic screening items	First screening (4-6 months)	Screenings for school-age children	Life transition period (15-18 years old) screening for teenagers not in school
	• Visual abnormalities (strabismus) • Growth abnormalities • Malnutrition • Accident prevention	• Basic screening items • Hearing abnormalities • Sudden infant death syndrome	• Identification of potential health risks • Musculoskeletal and spinal diseases • Eyesight, color blindness, eye diseases • Hearing abnormalities • Mental health • Ear diseases (middle ear infection, otitis) • Nasal diseases (sinusitis, rhinitis) • Throat diseases (tonsillitis, lymph node swelling, thyroid hypertrophy) • Skin diseases (atopic dermatitis, infectious dermatitis) • Proteinuria, occult blood in the urine • Anemia • Hepatitis B • High blood pressure • Diabetes • Dyslipidemia • Liver disease • Dental examination (teeth condition, oral condition)	• Obesity • Visual and auditory abnormalities • Identification of potential health risks • Tuberculosis, chest disease • Hepatitis B • Anemia • High blood pressure • Diabetes • Dyslipidemia • Liver disease • Dental examination
	Second screening (9-12 months)	Third screening (18-24 months)		
	• Basic screening items • Auditory abnormalities • Developmental abnormalities • Dental development	• Basic screening items • Auditory abnormalities • Developmental abnormalities • Knowledge of toilet training • Dental caries		
	Fourth screening (30-36 months)	Fifth screening (42-48 months)		
	• Basic screening items • Refractive errors (amblyopia) • Auditory abnormalities • Obesity • Developmental abnormalities • Exposure to digital media	• Basic screening items • Refractive errors (amblyopia) • Auditory abnormalities • Obesity • Developmental abnormalities • Social development • Dental caries		
	Sixth screening (54-60 months)	Seventh screening (66-71 months)		
	• Basic screening items • Refractive errors (amblyopia) • Obesity • Developmental abnormalities • Personal hygiene • Dental caries	• Basic screening items • Refractive errors (amblyopia) • Obesity • Developmental abnormalities • Preparation for school		

program that allows subjects to receive health screenings, including cancer screenings, at nearly no expense. A life cycle–based health screening program focusing on the most relevant diseases at each stage in life (infancy/early childhood, childhood/adolescence/young adulthood, adulthood, and old age) is shown in Table 7.1 [1,2].

	Adulthood (19-64) (General check-up) (Life transition period [40 years of age] screening)		Old age (65 years old and older) (General check-up) (Life transition period [66 years of age] screening)	
	Once every 2 years (annually for non-office occupations)		Once every 2 years (annually for non-office occupations)	
	General check-up	Life transition period (40 years of age) screening	General check-up	Life transition period (66 years of age) screening
	• Obesity • Visual and auditory abnormalities • Identification of potential health risks • Tuberculosis, chest disease • Kidney disease • Blood diseases, such as anemia • High blood pressure • Diabetes • Dyslipidemia • Liver diseases • Chronic kidney disease • Dental examination	• Obesity • Visual and auditory abnormalities • Identification of potential health risks • Tuberculosis, chest disease • Kidney disease • Blood diseases, such as anemia • High blood pressure • Diabetes • Dyslipidemia • Hepatitis B • Liver disease • Chronic kidney disease • Dental examination • Depression • Lifestyle habits evaluation	• Obesity • Visual and auditory abnormalities • Identification of potential health risks • Tuberculosis, chest disease • Kidney disease • Blood diseases, such as anemia • High blood pressure • Diabetes • Dyslipidemia • Liver disease • Chronic kidney disease • Dental examination • Cognitive dysfunction	• Obesity • Visual and auditory abnormalities • Identification of potential health risks • Tuberculosis, chest disease • Kidney disease • Blood diseases, such as anemia • High blood pressure • Diabetes • Dyslipidemia • Hepatitis B • Liver disease • Chronic kidney disease • Dental examination • Depression • Osteoporosis (females) • Senior body function assessment • Cognitive dysfunction • Lifestyle habits evaluation

Table 7.2 **The 5 major national cancer screening programs**
(Adapted from National Cancer Information Center [3])

Cancer type	Groups of people eligible for screenings	Screening intervals	Screening methods
Stomach cancer	Adults 40 years of age and older	2 years	Gastroscopy or gastrointestinal contrast
Liver cancer	High-risk adults 40 years of age and older (individuals diagnosed with cirrhosis, and those who are hepatitis B virus antigen–positive, or hepatitis C virus antibody–positive)	6 months	Liver ultrasound + serum alpha-fetoprotein test
Colon cancer	Adults 50 years of age and older	1 year	Fecal occult blood test (FOBT): if findings are abnormal, colonoscopy or double contrast barium enema (DCBE)
Breast cancer	Female adults 40 years of age and older	2 years	Mammography
Cervical cancer	Female adults 20 years of age and older	2 years	Cervical cytology (Pap smear test)

Health screenings are important because they can prevent both the occurrence of diseases and the resultant mortality, while also improving quality of life. For example, screening can reduce mortality rates by 25% for breast cancer and 20% for colon cancer, while reducing the occurrence of cervical cancer by 80%.

Compared to those who did not receive National Health Insurance Service (NHIS) health check-ups in Korea, Individuals who did were shown to have a 42% reduced chance of death from cardio-cerebrovascular diseases (myocardial infarction, stroke, etc.), and an 18% reduced chance of occurrence of cardio-cerebrovascular diseases. They also had less costly medical bills [4].

In particular, cancer patients of low socioeconomic status who are diagnosed through the national cancer screening program can receive financial aid from the government for their medical bills (Table 7.2) [5].

All individuals eligible for a health screening should receive one in order to benefit from these programs to the greatest extent possible.

Undoubtedly, the health screening rate of the South Korean population should be improved. An analysis of participation rate showed that only 48.3% of the population received cancer screenings, 76.1% received general health screenings, and 69.5% received infant health screenings. Hence, there is a need for more people to participate in health screenings [6].

It must be noted that the cancer screenings provided by the government do not help to prevent all types of cancer. Currently, the national health screening program provides screening only for cervical, breast, colon, stomach, and liver cancer. These 5 types of cancer were chosen because nationwide screening programs have been proven to increase early detection and to reduce the mortality rates for only these types of cancers

Similarly, the national health screening program does not prevent all types of chronic diseases. For example, we can expect only cardiovascular and cerebrovascular disease to be prevented through high blood pressure and diabetes screenings [1,4].

Additionally, the following principles are very important in regard to receiving health screenings. If the recommendation recommends that stomach cancer screenings should be done every 2 years, the screening results are effective only for 2 years, even if the result of the screening is negative. New cancers can occur after this period, and participating in the screening program regularly is necessary to maintain the effect. Finally, screening exams are designed to detect a disease before symptoms arise. Hence, if symptoms do appear, the patient must consult a doctor regardless of the screening schedule.

Even if an individual receives a health screening at each recommended interval, in unusual cases, an apparent disease can be diagnosed between screenings, within the recommended interval. This is a situation in which the screening results are negative, but a disease develops after the screening, causing the results to be a false negative. It is also possible to have a positive screening result, but a negative final diagnosis after diagnostic procedures are conducted. In such circumstances, the screening results are a false positive. Although efforts are being made to minimize such circumstances, false positives and negatives are unavoidable in the screening program.

However, this does not mean that one should receive health screenings as frequently as possible.

As discussed previously, screenings are conducted among all individuals within a certain age group who appear to be healthy; therefore, the impact of adverse effects such as false positives and false negatives will be especially apparent at the beginning of the screening program. As the screening programs continue, however, the ability to detect the occurrence of diseases, thereby reducing mortality, greatly outweighs any adverse effects, making the screening programs worthwhile.

If an individual receives repeated screenings for a disease for which the benefits of such screenings have not been proven, the adverse consequences of the health screenings could potentially outweigh the benefits. Hence, it is wise to consult a doctor if such a screening is required. Likewise, receiving a screening every 6 months when doctors recommend it every 2 years can cause adverse results. Hence, those that do want to receive more frequent screenings should first consult with a doctor.

However, it is sometimes necessary to be screened more often than is generally recommended or at an earlier age. For example, if an individual's mother or sister has a history of breast cancer, that individual may develop breast cancer at an early age. Hence, under such circumstances, it may be necessary to begin screenings earlier.

Although there is no upper age limit for the elderly in the national screening program, it is wise for the elderly to consult a doctor before undergoing a health screening. Although healthy elderly individuals need to undergo screenings regularly, seniors with failing bodily functions or those who suffer from another disease should consult with a doctor who is aware of their condition, rather than receive isolated general screenings.

When positive results are found through screening, follow-ups and possible confirmatory exams are needed in order to determine the presence of a disease, which is the purpose of receiving a health screening.

However, in reality, the follow-up process is often ignored. Studies have shown that 25% of those with positive or suspicious cancer screening results did not receive follow-up procedures. Even for general check-ups, only 30% of those who were requested to follow up did so. One of the reasons for this low follow-up rate may be that screenees may not correctly understand the meaning of suspicious or positive findings from their screenings.

When undergoing a health screening, it is best to know the meaning of positive and negative findings in advance. Negative findings, which are the majority of the findings, indicate that the individual simply needs to maintain healthy habits until they undergo a subsequent screening. However, positive results require the individual to consult with a doctor.

Fact Sheet ❷

Make sure that you receive the results of health screenings and practice the appropriate healthy habits

Abnormal findings are not rare in health screenings. The most common diagnoses are high blood pressure, diabetes, and dyslipidemia. A health screening program should treat these abnormal findings when they are found, through appropriate follow-up.

High blood pressure, dyslipidemia, and diabetes all have common causes: most notably, smoking, drinking, insufficient exercise, improper dietary habits, and obesity. These factors are also major causes of cancer, making the elimination of these factors a critical step to preventing and managing cancer and cardio-cerebrovascular diseases, which are major causes of death in South Korea.

Hence, when diagnosed with a lifestyle-related disease, such as high blood pressure, dyslipidemia, or diabetes, it is important to receive treatment from a doctor and to personally attempt to improve one's lifestyle habits.

Fortunately, national health screenings are mostly conducted at primary-care medical institutions, making it possible for a patient to receive advice on improving lifestyle habits when consulting a doctor regarding the screening results. A patient can live a long and healthy life by fully implementing a doctor's advice.

Fact Sheet ❸

Receive timely immunizations for your own health and that of the community

As experienced during the Middle East respiratory syndrome (MERS) epidemic, infectious diseases can have a huge ripple effect. Although there were numerous unavoidable casualties from MERS due to the absence of an effective vaccine, immunizations have been developed for many other infectious diseases. Increasing the immunization rate can maximize disease prevention, on both the individual and national levels.

The success of mass immunization programs has been recognized worldwide [7,8]. The Centers for Disease Control and Prevention of the United States even ranked immunization first among the top 10 public health achievements in the 20th century.

The effect of immunization is not limited to the individual receiving the vaccination. For example, if 80% of the population in a given community has received the immunization, an epidemic of the disease will not occur in the community, even if the remaining 20% of the population has not received the immunization. Hence, increasing the immunization rate is of the utmost importance.

Just 20-30 years ago, the rate of hepatitis B seropositivity in Korea was relatively high (9%), which led to a high rate of chronic hepatitis, cirrhosis, and liver cancer. However, since all infants were given hepatitis B immunizations starting in 1995, the rate of hepatitis B seropositivity has decreased to the low rate of 2%-3%. Rates of cirrhosis and liver cancer have also continued to fall. This is a case of a successful national immunization program—one in which the benefits can be appreciated by the public as a whole [9,10].

Hence, active participation of all citizens in the national immunization program promotes disease prevention at both the individual and community levels and helps to prevent epidemics in South Korea.

3.1 Immunizations can be received free of charge through the national immunization program

In the national immunization program of South Korea, the essential vaccinations are given from birth to 1 month of age, and throughout adulthood, based on the stages of the life cycle (refer to Table 7.3 for details) [11,12]. According to a study of the national immunization rate conducted in 2015, the percentage of children who received all recommended vaccines was high, with rates of 94.3% for children under the age of 1, 92.1% for children under 2, and 88.3% for children under 3 [13].

In the sporadic outbreaks of measles that occurred in South Korea in 2014, the imported cases and unvaccinated children were the primary victims, followed by secondary infections in hospitals and at schools. Hence, ensuring timely and complete immunizations in infants is a critical issue on both the individual level and the national level [14].

The high national immunization rate in South Korea is the result of cumulative efforts to expand free immunization programs, to increase the accessibility of medical facilities, and to send reminders of immunization dates through text messaging. According to a satisfaction survey of the national immunization support program and the guardian perception survey in 2014, 88.8% of the respondents replied that they would allow their children to "receive timely immunizations," and 77.6% stated it was "not a difficult task" to receive scheduled immunizations, indicating a highly receptive attitude towards receiving immunizations

at an appropriate age and in line with the recommended schedule [15].

In addition, adults (aged 65 or older) who are eligible for a free influenza vaccine should check and should follow the correct period. It takes approximately 2 weeks for antibodies to develop after a vaccine is administered; considering that influenza becomes most prevalent after December, individuals at a high risk for influenza should receive immunization within the recommended period [16]. The influenza immunization rate was 81.5% in November 2016 among those who were 65 years old or older.

However, according to the Korea National Health and Nutrition Examination Survey, the influenza vaccination rates remained very low (at only 30%-40%) among non-elderly individuals who should receive an annual influenza vaccination, such as pregnant women and patients with chronic diseases such as diabetes, asthma, chronic pulmonary disease, and cardiovascular disease. In addition, there is a low awareness about the need for immunizations, and this must be addressed promptly (Table 7.4).

3.2 Immunizations are safe and effective

When millions of people receive a vaccine, an extremely small number of people will inevitably experience adverse reactions. These adverse reactions are miniscule compared to the individual and social benefits of immunizations. The government is also making an effort to minimize adverse reactions; there is a policy in place in which the government reimburses individuals who experience adverse reactions.

Problems arise when adverse reactions are exaggerated in the media and affect the immunization rate. For example, in 1998, a falsified paper stating that vaccines cause autism was published, resulting in a drop in the immunization rates, which in turn led to consequent measles epidemics.

Immunizations are the most effective and cost-effective method of preventing infectious diseases, and the current immunization system is incredibly safe.

Table 7.3 **Standard Immunization Schedule for Children (2017)**

(Adapted from Korea Centers for Disease Control and Prevention, Korean Medical Association, Korea Advisory Committee on Immunization Practices [11])

	Target infectious disease	Vaccine type and method	Number of doses	Birth to 1 month	1 month	2 months	4 months	6 months	12 months	15 months	18 months	19-23 months	24-35 months	4 years old	6 years old	11 years old	12 years old
National immunization program	Tuberculosis[1]	BCG (intradermal)	1	BCG (intradermal) Single dose													
	Hepatitis B[2]	HepB	3	1st dose	2nd dose			3rd dose									
	Diphtheria, Tetanus, Pertussis	DTaP[3]	5			1st dose	2nd dose	3rd dose		4th dose				5th dose			
		Td/Tdap[4]	1													6th dose	
	Polio[5]	IPV	4			1st dose	2nd dose	3rd dose						4th dose			
	Haemophilus influenzae type B[6]	PRP-T/ HbOC	4			1st dose	2nd dose	3rd dose	4th dose								
	Pneumococcus	PCV (protein conjugate)[7]	4			1st dose	2nd dose	3rd dose	4th dose								
		PPSV (polysaccharide)[8]	–										Only for high-risk groups				
	Measles, Mumps, Rubella[9]	MMR	2						1st dose					2nd dose			
	Chickenpox	Var	1						Single dose								
	Hepatitis A[10]	HepA	2						1st and 2nd doses								
	Japanese encephalitis	IJEV (inactivated)[11]	5						1st-3rd doses (inactivated)						4th dose		5th dose
		LJEV (live attenuated)[12]	2						1st and 2nd doses (live attenuated)								
	Human papillomavirus[13]	HpV2/ HpV4	2														1st and 2nd doses
	Influenza	IIV (inactivated)[14]	–						Annually								
		LAIV (live attenuated)[15]	–										Annually				
Other immunizations	Tuberculosis[1]	BCG (percutaneous)	1	Single dose (percutaneous)													
	Rotavirus	RV1	2			1st dose	2nd dose										
		RV5	3			1st dose	2nd dose	3rd dose									

The national immunization program: immunization guidelines recommended by the government (through the 'Infectious Disease Control and Prevention Act,' the government determines the target infectious diseases and methods of immunization and imposes these methods on the public and health care providers.)

Other immunizations: Immunizations outside the national immunization program that are provided by private medical agencies.

① BCG (Bacillus Calmette-Guérin vaccine): Administer BCG within 4 weeks of birth.

② Hepatitis B: If a pregnant woman is positive for hepatitis B surface antigen (HBsAg), administer hepatitis B immunoglobulin (HBIG) and the hepatitis B vaccine simultaneously within 12 hours of birth. Afterwards, administer the second and third doses of the hepatitis B vaccine at 1 and 6 months of age.

③ DTaP (diphtheria, tetanus, pertussis; combined vaccine): It is possible to administer DTaP – IPV (diphtheria, tetanus, pertussis, polio) combination vaccines.

④ Td/Tdap: Administer additional dose of Td or Tdap at ages 11 through 12 years.

⑤ Polio: Administer the third dose at age 6 months; it can be administered up to age 18 months. Possible to administer DTaP – IPV (diphtheria, tetanus, pertussis, polio) combination vaccines.

※ DTaP-IPV (diphtheria, tetanus, pertussis, polio): It is possible to administer DTaP-IPV combination vaccines instead of DTaP and IPV at ages 2, 4, 6 months, and 4 through 6 years. In such cases, the first 3 doses should be administered with the vaccines made by the same manufacturer, but the DTaP vaccine administered at age 15 months through 18 months can be made by a different manufacturer.

⑥ *Haemophilus influenzae* type B (Hib): Administer to all young children aged 2 months through 5 years; children older than 5 years are given the dose only if they are at increased risk of a *Haemophilus influenzae* type B infection (sickle cell anemia, splenectomy, compromised immune system after chemotherapy, leukemia, HIV infection, humoral immunodeficiency, etc.).

⑦ Pneumococcal protein conjugate vaccine: mixing the 10-valent and 13-valent protein conjugate vaccines is not recommended.

⑧ Pneumococcal polysaccharide vaccine (PPSV): Administer to patients older than age 2 who have a high risk of pneumococcus, after patient-doctor consultation regarding the health status of the patient.

※ High-risk groups for pneumococcal infection:

- Immunocompromised children: HIV infection, chronic kidney disease and nephrotic syndrome, diseases treated with immunosuppressants or radiation (malignant tumors, leukemia, lymphoma, and Hodgkin disease), solid organ transplant, or congenital immunodeficiency conditions.
- Children with functional or anatomic asplenia: sickle cell anemia or hemoglobinemia, asplenia, or spleen dysfunction.
- Children who have a functional immune system but have one or more of the following conditions: chronic heart disease, chronic lung disease, diabetes, cerebrospinal fluid leakage, or a cochlear implant.

⑨ Measles: It is possible to administer the MMR vaccine at the ages of 6 months through 11 months during an outbreak—in such cases, another immunization is required after the age of 12 months.

⑩ Hepatitis A: Administer the first dose at age 12 months and an additional dose at ages 6 through 18 months (immunization schedule depends on the manufacturer).

⑪ Japanese encephalitis (inactivated): After the first dose, administer the second dose 7-30 days later. Administer the third dose 12 months after the second dose

⑫ Japanese encephalitis (live attenuated): After the first dose, administer the second dose 12 months later.

⑬ Human papillomavirus: Administer twice at a 6-month interval at age 12 (mixing type 2 and 4 vaccines is not recommended).

⑭ Influenza (inactivated): Administer annually to children aged 6 months through 59 months. In such cases, the first immunization should be administered twice at a 1-month interval, and once a year for the remainder (if the influenza immunization is only administered once in the first year, 2 doses should be administered, at a 1-month interval, in the following year).

Table 7.4 **Adult immunization schedule**

(Adapted from Korea Centers for Disease Control and Prevention [12])

Target infectious disease	Vaccine type	Aged 19-29	Aged 30-39	Aged 40-49	Aged 50-59	Aged 60-64	Aged 65 and older
Influenza	Flu	Single dose annually (recommendation level III)			Single dose annually (recommendation level I)		
Tetanus/ diphtheria/ pertussis	Td/Tdap[1]	1 dose of Td every 10 years, one of which should be a Tdap immunization (recommendation-level I)					
Pneumococcus	PPSV[2]	1-2 doses for at-risk groups[2] (recommendation level I)					Single dose (recommendation level I)
	PCV[3]	Patients with compromised immune systems, asplenia, cerebrospinal fluid leakage, or cochlear implants (recommendation level II)					
Hepatitis A	HepA	2 doses (recommendation level II)		Immunization after antibody test (recommendation level II)	Immunization of at-risk groups[4] after antibody test (recommendation level II)		
Hepatitis B	HepB	If it is uncertain whether the 3-dose series was administered, 1 dose should be administered after an antibody test (recommendation level III)					
Chickenpox	Var	2 doses for at-risk groups[5] after antibody test recommended (recommendation level II)					
Measles/ mumps/ rubella	MMR	At least 1 dose for at-risk groups[6]; rubella antibody test recommended for pregnant women (recommendation level II)					
Human papillomavirus	HPV	Females[7] (recommendation level II)					
Herpes zoster[8]	HZV					Single dose (recommendation level III)	
Meningococcus	MCV	1-2 doses for at-risk groups[9] (recommendation level II)					

Recommendation levels

(I) Top-priority recommendation: Can reduce the chance of death, and very cost-effective.

(II) Priority recommendation: Can reduce the chance of death, but may not be cost-effective domestically. Mostly recommended in developed countries.

(III) Recommendation: Reduces the chances of disease rather than death, and may not be cost-effective domestically.

❶ Tdap: Used for individuals between the ages of 11 and 64. However, if necessary, such as in a pertussis outbreak, it can be administered to patients older than 65.

❷ Pneumococcal polysaccharide vaccine: Administered to at-risk groups for pneumococcus and should be re-administered to patients with compromised immune systems or asplenia.

※ Pneumococcus risk groups

i) Patients with compromised immune systems due to HIV infection, chronic kidney failure and nephrotic syndrome, or diseases that require immunosuppressants or radiation as a part of treatment (malignant tumors, leukemia, lymphoma, Hodgkin disease).

ii) Functional or anatomic asplenia patients, with sickle cell anemia or hemoglobinemia, asplenia, or spleen dysfunction.

iii) Patients with functional immune systems, but with cerebrospinal fluid leakage or a cochlear implant.

iv) Patients with functional immune systems, but who have the following diseases: chronic heart disease, chronic lung disease, or diabetes.

❸ Pneumococcal protein conjugate vaccine: Of the pneumococcus risk groups given above, patients in groups i), ii), and iii) should be administered a polysaccharide vaccine at least 8 weeks after the pneumococcal protein conjugate vaccine is administered.

❹ Groups at risk for hepatitis A: Chronic liver disease patients, hemophilia patients who receive clotting factors regularly, childcare facility employees, medical or research employees who are at risk of exposure to hepatitis A virus, travelers or individuals planning to work in countries that have a high endemicity of infection, food industry employees who handle food, male homosexuals, drug addicts, and individuals who have come in contact with hepatitis A patients within the last 2 weeks.

❺ Groups at risk for chickenpox: Medical staff who are not immune to chickenpox, guardians of patients with compromised immune systems, school or kindergarten teachers, students, soldiers, prison inmates, females within a fertility window, teenagers or adults living with a child, and international travelers.

❻ Groups at risk for measles/mumps/rubella: Medical staff, travelers to developing countries, family members taking care of a patient with a compromised immune system, and adults living in groups; although antibody tests (especially for measles) can be conducted, it is more economical to administer the dose without testing.

❼ Human papillomavirus: Recommended for females younger than aged 25-26 who did not complete the immunization at ages 11 through 12.

❽ Herpes zoster: Administer to adults at age 60 or above.

❾ High-risk groups for meningococcus: Although a target group has not been clearly established domestically, people typically considered to be at risk for meningococcus are individuals with anatomic or functional asplenia or complement deficiency, soldiers (especially new recruits), laboratory employees who are exposed to meningococcus, and travelers or residents who will be in close contact with locals in an area where an epidemic of meningococcal disease is occurring.

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Contributing associations:

- Korean Medical Practitioners Association

  The Korean Vaccine Society

  The Korean Society for Preventive Medicine (KSPM)

Contributing experts:

- Hee Man Kim, Department of Gastroenterology, Yonsei University Wonju College of Medicine and Wonju Severance Christian Hospital

  Yu Jin Paek, Department of Family Medicine, Hallym University Sacred Heart Hospital

Ten Guidelines for a Healthy Life

08

Managing Stress

Jun Soo Kwon, Department of Psychiatry,
Seoul National University Hospital

Dae Hyun Yoon, Department of Neuropsychiatry,
Healthcare System Gangnam Center,
Seoul National University Hospital

Stress:
If you can't avoid it, tame it!

08 Stress: If you can't avoid it, tame it!

Managing Stress

Summary

◆ Background

Excessive stress is a cause of physical and mental illness, and it reduces our quality of life. Therefore, stress management and coping strategies are essential to improve health in modern society.

◆ Purpose

To help people improve their physical and mental health by providing stress management techniques for everyday life.

◆ Contents

1. The power of positivity: Get rid of stress

How one views stress is important; hence, if it is impossible to change your circumstances, you should change your way of thinking about your circumstances to minimize the adverse effects of stress.

2. Find your own coping strategies for stress

If you can't avoid stress, you should cope with it by reducing your negative responses to stress through techniques including abdominal breathing, stretching, and meditation.

3. The vitality of your life: Engage in leisure activities at least once per week

Enjoying a hobby in your free time reduces stress; therefore, it helps you maintain emotional stability and improves your quality of life.

◆ Expected impact

To provide people with coping strategies for unavoidable stress in everyday life and to minimize the adverse effects of stress by encouraging people to put these strategies into practice.

Best practices to follow

1. The power of positivity: Get rid of stress
2. Find your own coping strategies for stress
3. The vitality of your life: Engage in leisure activities at least once per week

Fact Sheet 1

The power of positivity: Get rid of stress

1.1 Change your way of thinking to reduce stress

Changing your way of thinking under stressful circumstances is not about changing the circumstances themselves, but about changing the way we think about our circumstances. The intensity of human stress is determined not by the circumstances that people face but by their thoughts about their circumstances. With half a glass of water, some would say, "The glass is half empty!" while others would say, "The glass is half full!" People can think from either a negative perspective or a positive perspective in any given circumstance. Furthermore, it is essential to grasp and thoroughly evaluate negative thoughts that are caused by stress, rather than to strive to get rid of such thoughts [1]. Changing excessively negative or absurd thoughts into positive and rational ones is a reliable way to rid oneself of difficult, burdensome emotions.

1.2 The positive engine of the mind: Improve self-esteem

A simple way to assess the level of your self-esteem is to reflect on your reaction to advice or criticism. If you become hurt or angry when you receive minor advice that a person would normally disregard, your self-esteem is low. The importance of self-esteem lies in the tremendous influence it has on your life, both present and future. Self-esteem is the combination of self-confidence (i.e., confidence that other people regard you favorably), and self-efficacy (i.e., the belief that you have the ability to complete your goals). You might think that your achievements can improve your self-esteem, but it is the other way around; self-esteem is the starting point of all achievements. Solid self-esteem is the cornerstone of successful experiences, and such experiences strengthen your self-esteem. Furthermore, even if you fail sometimes, self-esteem helps you to overcome failure by allowing you to cherish yourself without losing your initiative and courage. Moreover, there are successful people with low self-esteem. They have a false sense of strong self-esteem on the outside; hence, they are always made anxious by the thought that they are not loved by others, and they continue to be anxious even when they accomplish socially-valued achievements, striving to receive personal attention. They are obsessed with power rather than people, and they often cannot bear indifference or criticism from others. Even if it is not a matter of false self-esteem, when one is furious about something minor at a mall or a restaurant and says, for example, "Do you know who I am?" it is highly likely to be because of low self-esteem. In short, a person becomes angry at minor things due to diminished self-confidence and heightened self-anxiety.

There are 2 ways to foster solid self-esteem, just as if you were to engage in muscle training: self-acceptance and positive thinking. Self-

esteem is not built by perfection. To thoroughly take care of your responsibilities is a good thing, but obsessive perfectionism is evidence of anxiety about oneself. Self-acceptance is the ability to accept that you and your life are imperfect. Everyone can feel inferior. During your life, you are likely to meet people who are better than you in some particular area. In such cases, you should embrace common sense; as you have your own strengths, that person also has his or her own strengths. This rationalization is self-acceptance. In addition, self-esteem comes from a subjective perspective. When you maintain a positive perspective of yourself through self-acceptance by cherishing your strengths, you will build strong self-esteem.

People often equate stress management with an effort to either reduce or avoid stress, yet neither of those strategies is easy to accomplish. Rather than trying to reduce stress, maintaining strong self-esteem so that we can accept stress as a natural part of our lives is a more effective strategy. Taking seasonal trips can be an effective way to cultivate self-acceptance and positive thinking. When you are able to escape your busy, everyday life and reflect on your life, you will be able to counteract negativity and regain positivity in your life.

Fact Sheet ❷

Find your own coping strategies for stress

2.1 Reduce negative physical and mental stress responses through coping strategies

Excessive stress is a cause of illness, but an appropriate amount of stress is the source of energy you need to improve your quality of life. If you

have your own coping strategies for stress, such as meditation, deep breathing, stretching, or music, stress can be your everyday life partner instead of your enemy.

One of the ways to reduce a negative stress response is meditation, which involves looking at your life and yourself as they are. Meditation practice helps to focus one's mind on the present by turning the mind's focus from the outer world to the inner one. In the past, meditation had a religious or philosophical purpose. However, life has become much more complicated since the industrialization of the 1950s. As a solution for life's problems, meditation has become a common way to relieve the pain of reality on an existential level.

To meditate, start by observing and controlling your breathing through breathing meditation, which refers to focusing on your breathing for 10 minutes, twice a day. In the beginning, you should practice in a quiet, comfortable place, and gradually train yourself to concentrate on breathing anywhere, at any time. Concentration is like a muscle; hence, your ability to concentrate is enhanced by constant practice. According to research, regular 10-minute meditation sessions have the following effects. Among the elderly, systolic blood pressure was found to decrease by 11 mmHg and diastolic blood pressure by 6 mmHg. Additionally, the smoking rate was found to decrease by 13%, and substance abuse was found to decrease. Other reported effects include a 30% lower cholesterol level, social and psychological stress

reduction, a 33% lower risk of cardiovascular disease after a year, an 11% decrease in the incidence of stroke or myocardial infarction among the elderly, an increased ability to exercise, and a decrease in the total mortality rate.

2.2 Cope well with anger, a cause of heart disease

Anger management is a difficult task. However, if you suppress anger and keep it in your mind, it will grow like well-fermented, aged kimchi. Hence you need to strive to resolve anger each time it arises. Here are a few basic tips for anger management in everyday life, although they are not magnificent philosophical solutions. First, if you feel angry, you should observe your feelings for a day or so instead of expressing them. When you are in an excited state, you may show an excessively aggressive response. Thus, you may hurt yourself and others involved, or get angry at small things if you immediately express your anger in this state. Research shows that married couples fight more on an empty stomach because people have low blood sugar when they are hungry. In such a case, there is no need to get angry—just having a meal will reduce your anger.

If you are still angry after observing your emotions for a day or more, you should consider whether it is worth expressing your anger with the other party. Expressing anger to another person can also negatively affect one's own mental state; hence, if that person is not worth your energy, you should express your anger by keeping away from the person or trying not to think about that person. When you act out your anger, you make an effort to hurt the other party as badly as you have suffered. However, your anger can actually make the other person feel more at ease. As acting out your anger is not mature, the other person could

rationalize his or her own mistakes by thinking that you pretended to be kindly disposed to them when you really were not.

If it is important to express your anger, you should explain the behavior that upset you to the other party as specifically as possible. Your relationship with the person will not improve if you rudely express your anger by saying, "You're weird and hopeless," or, "What is wrong with your family?" without pointing out the specific cause of your anger. Doing so will only hurt yourself more.

Here is an example of a counseling experience. A woman hated that her boyfriend got along well with younger female coworkers. Even though she talked about the issue with her boyfriend many times, she and her boyfriend could not resolve the problem; they fought a lot and they eventually ended up on the brink of a break-up. The psychiatrist recommended that the woman not vaguely talk about the problem with her boyfriend, but specifically write down 2-3 things that bothered her on paper and ask her boyfriend to promise not to do them. An example of such an item was, 'Unless the meeting is work-related, you should not meet with younger women privately.' The patient doubted the psychiatrist's recommendation, but the psychiatrist insisted on it, telling her that it wouldn't hurt to try since she was thinking about breaking up with her boyfriend anyway. Later, their relationship improved and they remained together. The woman was surprised that her boyfriend listened to her requests; before that, even though she had gotten angry about the same thing a number of times, the boyfriend did not originally understand what she was so angry about. Additionally, keep in mind that when you talk about upsetting things, you should give compliments too; for example, "I really like this about you. But, when you do that, it upsets me." In this way, you can motivate the other party to change in a positive way by making the person feel good about him or herself. Consequently,

a compliment could help increase the person's self-esteem, which could then encourage the person to become an even better person.

2.3 Cope well with excessive anxiety, the thief of happiness

Anxiety is an emotional response that contributes to survival, but excessive anxiety disrupts one's life. For example, a student without any anxiety about exams will not get a good test grade. This idea illustrates optimal stress theory. The proper amount of stress makes our brain function most effectively.

However, when anxiety becomes excessive, it impedes cognitive function and makes a person unhappy. Such stress affects the secretion and circulation of digestive juices and the distribution of blood in the vessels, and these factors influence gastrointestinal function. Namely, stress causes epigastric tightening, which leads to sudden indigestion or diarrhea. More specifically, the esophagus, stomach, small intestine, and large intestine regulate themselves through numerous nerves and hormones as they steadily 'converse' with the brain. External stimuli such as sight or smell, as well as the functions of the central nervous system, including feelings and thoughts, influence biological processes, including sensation, movement, inflammation, and secretions of the gastrointestinal tract. Furthermore, various stimuli that arise from inside the gastrointestinal tract have an influence on feelings, behaviors, or pain recognition in the central nervous system. Thus, a person's stomach and large intestine function like a stress litmus test that can warn the body before a person even recognizes stress.

Therefore, if your anxiety is excessive, you should try to reduce it, but reducing anxiety is a harder task than you may think because the mind, which controls emotions, does not respond to self-talk. Thus, no matter how many times you tell yourself not to worry, your efforts may be futile

or make you feel even more uneasy.

In order to brush aside the stress that causes you too much anxiety, speaking to yourself is not enough. Instead, letting your heart feel the peace of the moment is the key to doing so. One great way of doing this is to have a face-to-face, warm, empathetic conversation [2]. To see why this is effective, keep in mind that it is not possible to have warm conversations with your friends in the middle of combat. Thus, when you engage in warm, empathetic communication, your mind believes that the war is over, which helps to reduce signs of anxiety. Furthermore, breathing in nature and moving your body can help significantly reduce anxiety. For example, at lunchtime, making time for a 10-minute walk, even if it is short, with a cup of coffee as you look at the sky and your surroundings will help. Obviously, it is not possible to enjoy such relaxation in combat situations. If you relax, your mind becomes less anxious. For the same reason, immersing yourself in cultural activities greatly helps to reduce excessive signs of anxiety.

It is well known that enjoying people, nature, and culture helps reduce signs of anxiety; however, isn't it the case that the reason we want to live even when we often feel anxious is to enjoy people, nature, and culture? Although it may seem easy, this is a surprisingly hard task. You get used to your work because the neural network of your brain that is related to your work is activated. In a similar manner, you should continuously enjoy people, nature, and culture so that the relaxation circuitry in your brain is able to activate itself. A well-trained person can regain enough energy—the equivalent of the energy from a trip to Jeju Island for 9 nights and 10 days—from a 10-minute walk during lunch.

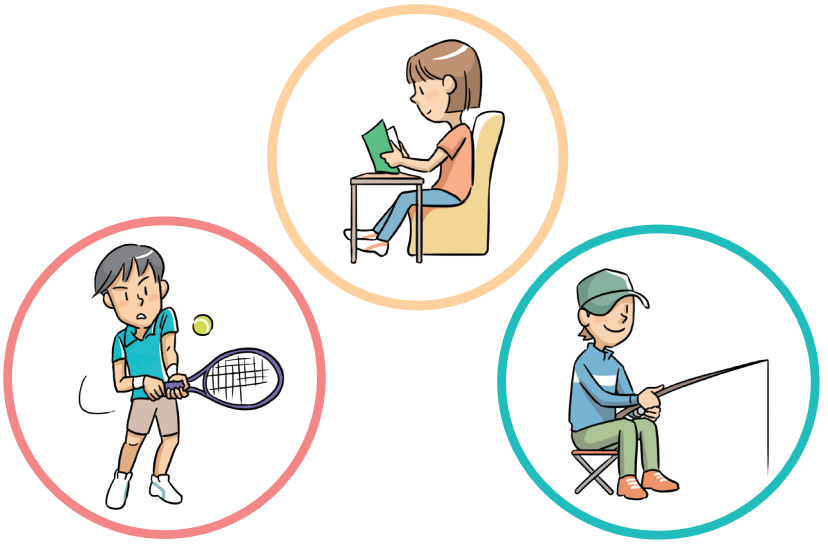
Fact Sheet ❸

The vitality of your life: Engage in leisure activities at least once per week.

3.1 Engage in at least one hobby in your free time

In our life, oil is a necessary commodity. If business activities are the gasoline of life, leisure activities are the lubricant. To illustrate, you need gasoline to start up a car at first; however, lubricant is just as important because the car would break down without it, as its engine would become stiff in the long run. Leisure activities enrich the mind and prevent depression [3]. Etymologically, leisure time means "time for enlightenment through self-cultivation." The Latin word "licere", which means "to be free," evolved into the French word "laisser," which means "be allowed," and eventually become today's English word, "leisure." The Latin word "licere" also is the source of the modern English words "liberty" and "license" [4]. To be clear, spend at least 1 hour a week engaged in leisure activities, and give yourself the free time necessary for inner satisfaction. Any hobby will suffice.

Leisure time includes physical or mental activities that an individual chooses freely when pursuing the enjoyable aspects of life, including rest, pleasure, satisfaction, and joy. Leisure activities not only reduce mental and physical fatigue and regenerate energy, but also help one find emotional stability by reducing stress, desire, complaints, conflicts, frustration, and emotional anxiety in one's social life [5]. From a socio-psychological perspective, as opposed to the variety, number, or intensity of the leisure activities you choose, the level of engagement and enjoyment you experience while participating in leisure activities is closely related to one's quality of life. Therefore, there is no set answer for



which leisure activity is best or how long you need to engage in it. Below, we discuss a range of leisure activities, but you should focus on finding the right hobby for you.

First, physical activities require you to use your body as a form of expression; such activities include playing sports, playing games, and dancing. Second, social activities stem from a motivation for interpersonal interactions and may include events such as picnics, parties, or social gatherings. Third, cultural activities are based on arts and history; this category includes activities involving art, music, theater, and folk traditions. Fourth, nature activities take place outdoors, and the aim of participating in them is to be in contact with the natural world; this category includes fishing, camping, hiking, and learning about nature. Fifth, mental activities may include reading and creativity; the main motivation here is self-expression or intellectual stimulation. Again, any activity is fine. Find a hobby in which you can immerse yourself and enjoy your time.

3.2 To cut down on drinking and smoking, have a hobby

A hobby is both an 'ability' and an 'activity' that allows you to enjoy nature, arts, and culture. Having a hobby that you are passionate about can become a valuable substitute for other comforts in your life, which makes it easier to quit alcohol and cigarettes; otherwise, you may be likely to go back to drinking and smoking when things get tough, even after you have made intense efforts to quit. Use the energy you spend struggling with alcohol and cigarettes on your hobby instead. You should not use a hobby simply as a means to quit drinking and smoking; instead, engaging in a hobby should be the goal in itself. Exercise should also be an enjoyable hobby and not be considered a chore, because then you are more likely to make it a consistent habit, without getting burned out.

Work, relationships, and the freedom to relax and enjoy a hobby are the 3 elements of happiness, and it is important to have a balance of all 3 elements in your life. During counseling sessions, when a psychiatrist asks patients who feel depressed and lack interest and motivation, "Do you have a hobby?", even though they have led an exemplary life, many reply, "I don't know how to have a good time," or, "I don't have free time." They consider work a means of survival, so it is more important than having a hobby. Hence, they have missed the opportunity to acquire the necessary skills to console their minds and to enjoy the beauty of the world. As you get better at your work over time, you also need to have a hobby to foster your ability to enjoy the beauty of the world. When looking up at the blue sky, each person is inspired differently. Sometimes, you may fear that your work might go wrong, but there is no need to worry. When you enjoy yourself, you will be able to work joyfully and succeed in what you do.

3.3 Tips for recharging a tired mind: Disconnect to connect

Burnout syndrome is a state in which the mind is totally exhausted. When a person has burnout syndrome, there are 3 clear problems. First, all motivation is lost. You do not want to work. No matter how hard you try to encourage yourself, you are not motivated. Second, the syndrome causes a low sense of achievement. It is hard for you to feel satisfaction even if you work hard and reach a goal. Third, you experience a notable decline in your ability to empathize with others. Empathy is the ability to console others and to be consoled by others. When you are tired, you are normally reenergized by receiving warm support from others; instead, when affected by burnout syndrome, you may fall into a mental state in which you are not able to accept support, let alone provide it to others.

The stress system in the brain becomes very strongly activated due to the effort it takes to process overflowing amounts of external information; this is the state of the human brain today. If the stress system is constantly activated, and there are no outlets for it to recharge, the brain will become exhausted and burnout will occur. Thus, disconnection training should be done to cut off our brain's connection to external information for 10 minutes in a day. When you leave the battlefield against external information for a while, your emotional battery has a chance to charge itself fully. Here are some tips on how to disconnect.

1. Breathe deeply 3 times and feel the flow of your breath.

   After arriving at work, focus on feeling the flow of your breath and pay attention to your mind while your computer is booting up, before a meeting, or while you are waiting for the coffee you ordered.

2. Have a meal and savor it in a quiet place.

   Slow eating, in which you feel the color, smell, and movement of a grain of rice, greatly helps to concentrate on the inner world.

3. Take a daily 10-minute walk while contemplating.

   When you feel the free movement of your body, the brain releases tension, so you can relax as you reflect on your thoughts.

4. Have a healing conversation with a friend once a week.

   A tired and anxious mind has no room for the relaxation you need to reflect. There is no better consolation than having an empathetic conversation.

5. Watch a sad movie or go to an art exhibition once a week.

   Stimulating your mind by appreciating something pleasant and fun is a way of changing your mood. If you can mindfully change your emotions often, you will tend to reflect less on the sadness in your life.

6. Read 3 poems a week.

   The human mind is moved by metaphor, not logic. Being familiar with metaphor helps you obtain insights into your mind.

7. Leave your smartphone at home and take a day trip by train.

   Gazing out a train window has a meditative effect. In doing so, your mind and your ability to reflect will grow.

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Contributing organizations and associations:

» The Korean Academy of Family Medicine

The Korean Society of Neurogastroenterology and Motility

Korean Neuropsychiatric Association (KNPA)

Ten Guidelines for a Healthy Life

09

Paying Attention to Particulate Matter (PM_{10} and $PM_{2.5}$) and Emerging Infectious Diseases

Jacob Lee, Department of Infectious Diseases, Hallym University Kangnam Sacred Heart Hospital

Jong Han Leem, Department of Occupational and Environmental Medicine, Inha University Hospital

Preventing damage from particulate matter and emerging infectious diseases paves the road to longevity!

09 Preventing damage from particulate matter and emerging infectious diseases paves the road to longevity!

Paying Attention to Particulate Matter (PM_{10} and $PM_{2.5}$) and Emerging Infectious Diseases

Summary

◆ **Background**

In 2016, the Organization for Economic Co-operation and Development (OECD) identified the Republic of Korea as the country in which mortality due to air pollution was expected to increase most rapidly by 2060. Due to air pollution, 1% of the gross world product (GWP) is expected to be lost in 2060, by means of increased medical expenses and reduced labor productivity; South Korea has a projected loss of gross domestic product (GDP) of 0.63%, which is the highest projected loss among the OECD nations. Meanwhile, the epidemics of Middle Eastern respiratory syndrome (MERS) in Korea and the Zika virus in Central and South America have heightened public interest in emerging infectious diseases, which calls for practical preventive guidelines.

◆ **Purpose**

To make Korea safe by preventing health damage from particulate matter and fostering public interest in emerging infectious diseases.

◆ **Contents**

1. Refrain from going out and using cars when a particulate matter watch or warning is declared

The major source of particulate matter (PM) in Korea is traffic, which must be curtailed to reduce the levels of PM. Among the various types of exhaust emissions produced by vehicles, diesel engine exhaust (DEE) is the most important, and the influence of DEE on health has been researched the most. DEE contains many carcinogens, mutagens, and reproductive toxins.

2. Swine flu? MERS? Learning about emerging infectious diseases is important

Emerging or re-emerging infectious diseases are occurring everywhere. Studying and preparing before a trip can ensure safe travel.

3. Adhering to prevention practices for infectious diseases is the number-one component of health etiquette!

Practicing good hand hygiene and cough etiquette can help make Korea safe.

◆ **Expected impact**

These practical guidelines will greatly reduce the negative health effects of PM, because they will encourage people to avoid going out or using cars when a PM watch or warning is declared, resulting in the reduction of exposure and traffic exhaust. The suggestions made in this chapter will also help make Korea safe from emerging infectious diseases.

Best practices to follow

1. Refrain from going out and using cars when a particulate matter watch or warning is declared
2. Swine flu? MERS? Learning about emerging infectious diseases is important
3. Adhering to prevention practices for infectious diseases is the number-one component of health etiquette!

Fact Sheet 1

Refrain from going out and using cars when a particulate matter watch or warning is declared

1.1 Health effects of particulate matter

Particles that are visible to the human eye are 100 μm in diameter or larger, whereas particulate matter (PM_{10}) refers to small particles that are 10 μm or less in diameter. Fine particles ($PM_{2.5}$) are extremely small, smaller than or equal to 2.5 μm in diameter. While large particles that are 10 μm in diameter or larger (e.g., cement powder or pollen) are naturally filtered out by the nose or bronchus, PM_{10} (e.g., cigarette smoke or automobile exhaust) is composed of respirable particles that can enter the respiratory tract and be deposited in the lung. The small size of these particles makes it easier for them to be deposited in the alveoli; the smaller the size, the more likely it is that the filtering function of the nasal mucous membrane will fail, resulting in the deposition of the particle in the alveoli. It is not yet clear how such forms of PM adversely

affect the human body; the medical community predicts only that fine particles deposited in the alveoli will flow into the blood through the pulmonary capillaries, increasing the viscosity of the blood and elevating the risk of angina pectoris and myocardial infarction. These forms of PM also contain heavy metals such as lead, copper, chrome, zinc, and cadmium, and they also sometimes contain harmful acidic substances such as sulfate and nitrate. The PM floating in the air can absorb volatile organic chemicals (e.g., benzene and formaldehyde) emitted from construction materials or furniture, and can also absorb carcinogens such as polycyclic aromatic hydrocarbons (PAHs), which can turn into secondary toxic substances in the lung, thereby turning polluted indoor air into a serious threat to health. In other words, the harmful substances contained in PM are just as dangerous as the effects of the PM itself.

It has not been long since humanity discovered that people can die from the air pollution caused by PM and that PM can cause various diseases. In the winter of 1952 in London, the aggravation of sulfurous acid gas and PM pollution caused the Great Smog. When the smog became severe between December 5 and 12, the number of people hospitalized increased drastically, and the mortality rate was 3 times higher than usual, bringing the total death toll to 4,000. This incident led people to recognize that air pollution can cause serious harm to people.

Not many cases of exposure to high concentrations of air pollutants such as the Great Smog of London have been reported since then. However, we face continuous exposure to low-density air pollution, which is associated with a wide range of deleterious effects on health.

In both Korean and international air-born pollution epidemiologic studies, prospective cohort studies on the relationship between the mortality rate and chronic exposure to outdoor air pollution are very useful for elucidating the health effects of long-term exposure

to dust. Using this method, researchers can follow up on a particular population group with specific characteristics over the course of years, and can evaluate mortality and morbidity within the group. In such cohort studies, confounding variables on the individual level (e.g., smoking history, occupation, etc.) can be controlled for, which means that the health effects of long-term exposure can be clearly identified. Representative cohort studies include a Harvard study on 6 U.S. cities [1], and a study by the American Cancer Society (ACS) [2].

The Harvard study on 6 U.S. cities reported that a 10 $\mu g/m^3$ increase of $PM_{2.5}$ led to an 14% increase in the mortality rate, and a 19% increase in the mortality rate from cardiovascular or respiratory diseases. The ACS study similarly showed that a 10 $\mu g/m^3$ increase of $PM_{2.5}$ led to a 7% increase in the total mortality rate, and a 12% increase in the mortality rate from cardiovascular or respiratory diseases. Taken together, these studies indicated that current concentrations of PM can seriously affect the health of citizens.

An increasing number of epidemiologic studies have confirmed the associations of short-term and long-term atmospheric exposure to $PM_{2.5}$ with harmful health effects. Days, months, or years of long-term exposure to PM are statistically significantly associated with serious health effects (e.g., mortality rate, hospitalization, and outpatient visits). Chronic exposure to PM for years or decades seems to be even more closely associated with shortened lifespans, to a degree that cannot be explained by the simple accumulation of the acute effects of short-term exposure. Uncertainly remains regarding the magnitude of chronic health effects of long-term exposure to PM and the mechanisms underlying the effects of long-term and short-term exposure. According to the life table calculated by Brunekeef, relatively small differences in long-term exposure to atmospheric PM had a substantial impact on the

lifespan [3]. For example, the calculations of the lifespan for American white males from 1969 to 1971 showed that chronic exposure to 10 μg/m^3 of PM reduced the life expectancy of the total population at 25 by 1.3 years. Additionally, if new evidence regarding the associations between exposure to PM and infant mortality, and its effects on intrauterine growth retardation and low birth-weight infants, is confirmed, continued long-term exposure will reduce the lifespan of the total population even more than Brunekeef predicted.

Recent toxicological studies have presented limited but intriguing evidence suggesting that specific mixtures of atmospheric PM or PM of a particular substance can have distinct effects on human health. Studies have suggested that certain kinds of PM can be more harmful than others; for example, an epidemiological study conducted in Utah Valley reported that exposure to PM_{10} particles laden with metal components when the steel mills were running was associated more strongly with harmful health effects than reduced exposure to PM_{10} particles when the steel mills were not running.

The sources of PM differ depending on their size. While $PM_{2.5}$ is generated by the condensation of gaseous matter, PM_{10} contains other elements as well, such as coarse particles ($PM_{10\text{-}2.5}$) that are created by mechanical pulverization. Therefore, the source of $PM_{2.5}$ is more easily traceable than that of PM_{10}, and the source of $PM_{2.5}$ is also more relevant to understanding its health effects.

PM has also been reported to cause a reduction in heart rate variability, which is an indicator of elevated risk for serious cardiovascular problems, such as heart attack. Other studies have found that changes in hematologic features such as C-reactive protein, which is associated with an increased risk of ischemic heart disease, are associated with atmospheric PM exposure.

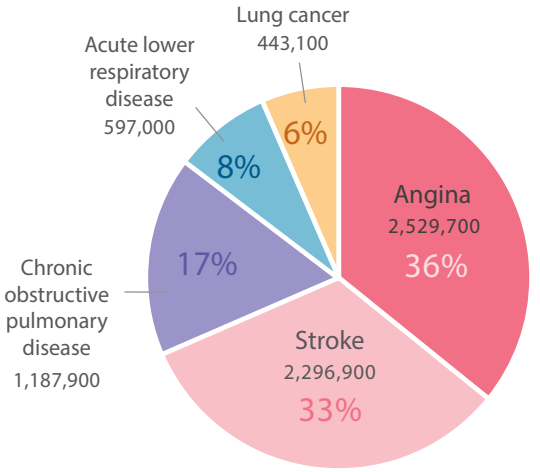
According to the research conducted by the National Cancer Institute in the U.S., which the World Health Organization (WHO) used as a major basis for classifying DEE as a group 1 carcinogen, the main carcinogenic factor in the emission is respirable elemental carbon [4]. In 2013, WHO took a step further and designated outdoor air pollution itself as a group 1 carcinogen, on the basis of sufficient evidence to conclude that it can cause cancer in humans [5].

In South Korea, there were 23,177 cases of lung cancer in 2013. Recently, among lung cancer patients, the number of lung adenocarcinoma patients with no history of smoking is increasing. According to the risk assessment method of the WHO, the mortality rate of lung cancer due to fine dust was as high as 21% when fine dust concentrations were calculated based on the current pollution level ($PM_{2.5}$ concentration of 29 μg/m^3). When calculated based on recent air pollution concentrations and air pollution concentration estimates, premature deaths in the Seoul metropolitan area amounted to 15,700, according to the annual average concentration of air pollution in the Seoul metropolitan area compared to the WHO baseline from 2010. If no countermeasures are taken, this number will jump to 26,388 in 2024. However, if countermeasures are taken, this figure is expected to be 35% less, at 17,143 (using a $PM_{2.5}$ concentration of 20 μg/m^3) [6]. As has been made evident by now, the impact of PM on our health cannot be underestimated.

According to the rates of disease-specific mortality caused by indoor and outdoor fine particulate air pollution estimated by the WHO in 2012, the total number of premature deaths was 7 million, which is more than the number of premature deaths caused by tobacco (Fig. 9.1). Integrating the global health damage caused by fine particles, the number of premature deaths was highest for angina (36%), followed by stroke (33%), chronic obstructive pulmonary disease (17%), acute

lower respiratory disease (8%), and lung cancer (6%). The situation was no different in Korea: angina, stroke, chronic obstructive pulmonary disease, acute lower respiratory disease, and lung cancer were the predominant causes of death caused by fine particulate air pollution in Korea [7]. According to a study conducted in Korea, 15.9% of premature deaths in the Seoul metropolitan area in 2010 were caused by one of these diseases; that is, 1 out of 6 deaths was from fine particulate pollution.

Figure 9.1 **Estimates of disease-specific mortality caused by indoor and outdoor air pollution** (Adapted from WHO [7])

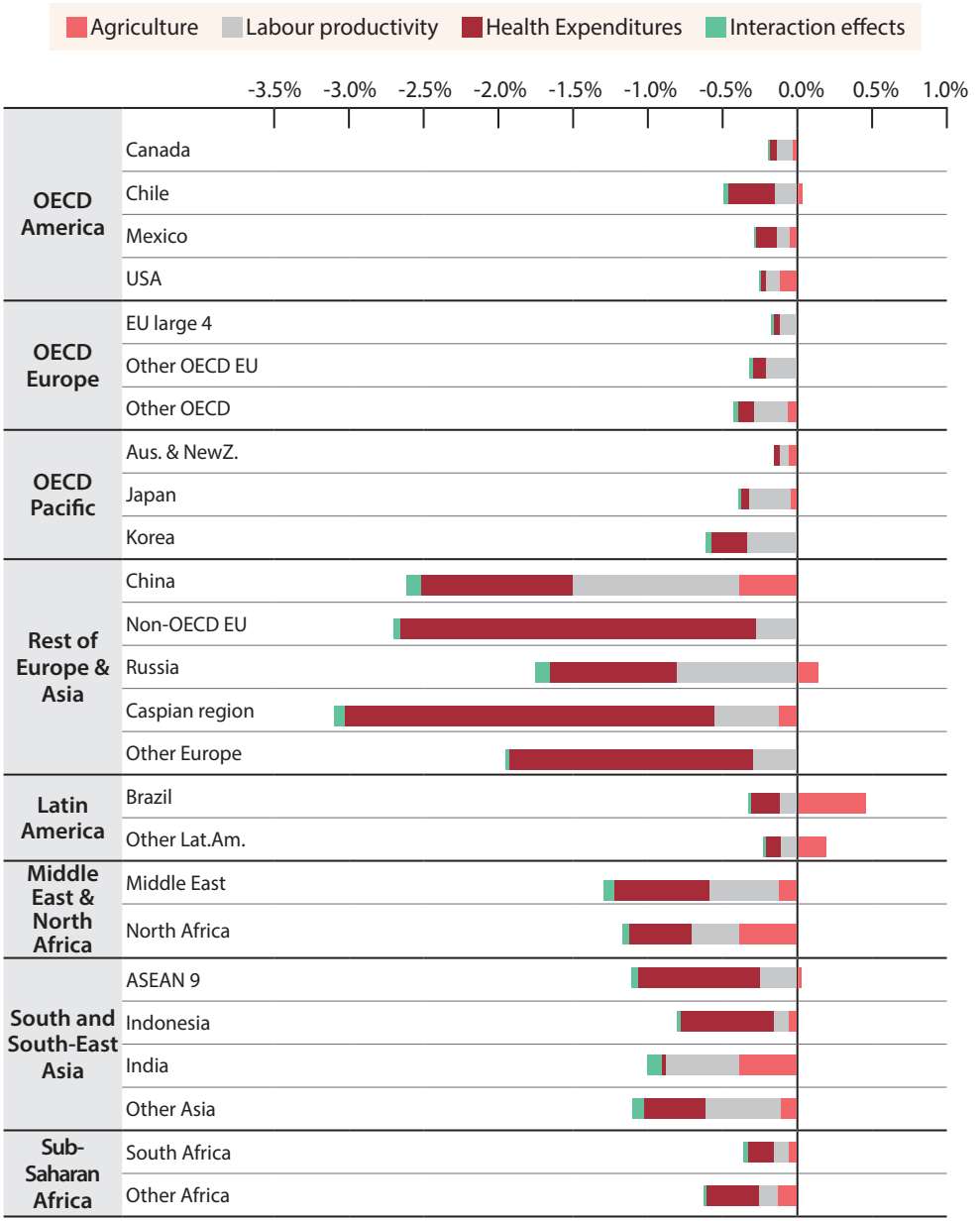


The OECD warned of the seriousness of PM in Korea. Korea's average $PM_{2.5}$ concentration is 29 μg/m^3, which is twice the OECD average.

At this rate, in 2060, Korea will be the OECD nation with the highest mortality rate and the largest economic loss due to air pollution. In its report, "The economic consequences of outdoor air pollution" (2016), the OECD identified Korea as the country in which mortality due to air pollution is expected to increase the most dramatically through 2060, estimating that premature deaths in Korea will account for 1,109 of every 1 million people (the highest rate among the OECD countries) [8]. The mortality rate of Korea in 2010 was similar to, or lower than, that of Japan and European Union countries, but it is projected to increase by more than 3 times by 2060, and this is expected to happen in Korea only. The same OECD report also anticipates severe economic losses for Korea. One percent of the annual GWP in 2060 is expected to be lost due to the increase of medical expenses and the decrease of labor productivity associated with air pollution; although Korea will suffer less air pollution damage than China or India, Korea's loss of GDP is expected to be 0.63%, which is the highest among the OECD nations (Fig. 9.2).

Our society is now rapidly becoming an aging society, which means that the increase of fine particles can pose a serious threat to the health of vulnerable groups such as children and senior citizens. European OECD nations are trying to ban diesel cars from the market to improve air quality; similarly, it is time for Korea to implement wide-ranging and effective policies as well.

Figure 9.2 **GDP decrease due to air pollution** (Adapted from OECD [8])



Source: ENV-Linkages model.

1.2 Particulate matter emissions from automobiles and their effects on health

There are various categories of transportation-induced exhaust emissions; diesel engine exhaust (DEE) is the most important, and the influence of DEE on health has been researched the most. DEE is composed of hundreds of gases and PMs; its gaseous components include carbon dioxide, oxygen, nitrogen, water vapor, carbon monoxide, nitrogenous compounds, sulfur compounds, and various kinds of low-molecular-weight hydrocarbons (e.g., aldehydes [such as formaldehyde, acetaldehyde, and acrolein], benzene, 1,3-butadiene, PAHs, and nitro-PAHs). Diesel exhaust particulate (DEP) is the main contributing factor to the PM present in urban areas, and it consists of carbon core, absorbed organic compounds, small amounts of sulfates, nitrates, and heavy metals, and other infinitesimal elements. DEP is composed of $PM_{2.5}$, and it also contains a fair amount of ultrafine particles with a size of 0.1 μm or less. These ultrafine particles function as a medium for absorbing organic substances due to their large surface area. Since they are very small, they can easily be inhaled, penetrating deep into the lungs and resulting in local or systemic health effects. In particular, their associations with respiratory and allergic diseases have been confirmed by a series of experimental studies [9].

Meanwhile, the fine particles emitted by cars coagulate and condense within seconds after emission, and the composition and distribution of these PMs significantly change as the distance from the main street increases. Therefore, people residing adjacent to main streets are likely to be exposed to more car-emitted particles, as well as to more toxic exhaust aerosol. Considering the mechanisms through which exposure to car exhaust emissions, including DEP, leads to inflammatory

responses of the respiratory tract or the mucous membranes, changes in the immune response, or to increased sensitization to allergens, residing near main streets could result in high-density exposure to car exhaust emissions, with severe impacts on the residents' health, potentially including the incidence of diseases such as asthma.

When inflammation is induced by traffic pollutants, the permeability of epithelial cells increases and the pollutants pass through the mucosal barrier, boosting allergen-induced inflammatory responses. Studies of human exposure have confirmed that exposure to DEP, NO_2, and SO_2 aggravated the symptoms of allergy patients and even induced direct inflammatory responses. In a panel study of 19 asthmatic children in Seattle, when the daily density of $PM_{2.5}$ increased by 10 μg/m^3, nitric oxide (NO) also increased by 4.3 ppb. As the exposure to atmospheric elemental carbon is increased, NO increases, which explains why car exhaust emissions can cause airway inflammation.

Additionally, it has been confirmed that DEP is associated with allergen sensitization and the incidence of allergic diseases. DEP is a form of respiratory PM that has a large surface area per unit mass, meaning that it easily absorbs protein components and acts as a medium for transferring them to the peripheral airways. Since it can bind with pollen allergens, it can function similarly to airborne antigens, or it could function as a stronger allergen. In vivo animal experiments have shown that exposure to DEP with allergens increased levels of the Th-2 cytokine and immunoglobulin E (lgE) more than exposure to allergens alone; it also increased inflammatory responses from target organ tissues [10]. In vitro culture studies have also shown that DEP induced lgE production.

Oxidative stress is an important underlying mechanism of the toxic reaction through which traffic-induced air pollutants—that is, automobile exhaust—causes or aggravates asthma. In addition, childhood asthma is associated with a reduction of the number of components related to antioxidant defense mechanisms. Traffic-induced pollutants, such as NO_2 and PM, generate free radicals and reactive oxygen species (ROS), and the ROS are counteracted in the airway by antioxidants. However, when these antioxidant defense mechanisms are overpowered, oxidative stress increases, and the subsequent inflammatory response causes an increase in the formation of ROS and inflammation. In other words, high-density ROS causes a depletion of local antioxidants, thereby precipitating the expansion of inflammatory responses outside of the target tissue, resulting in airway inflammatory responses such as those that occur in asthma [11].

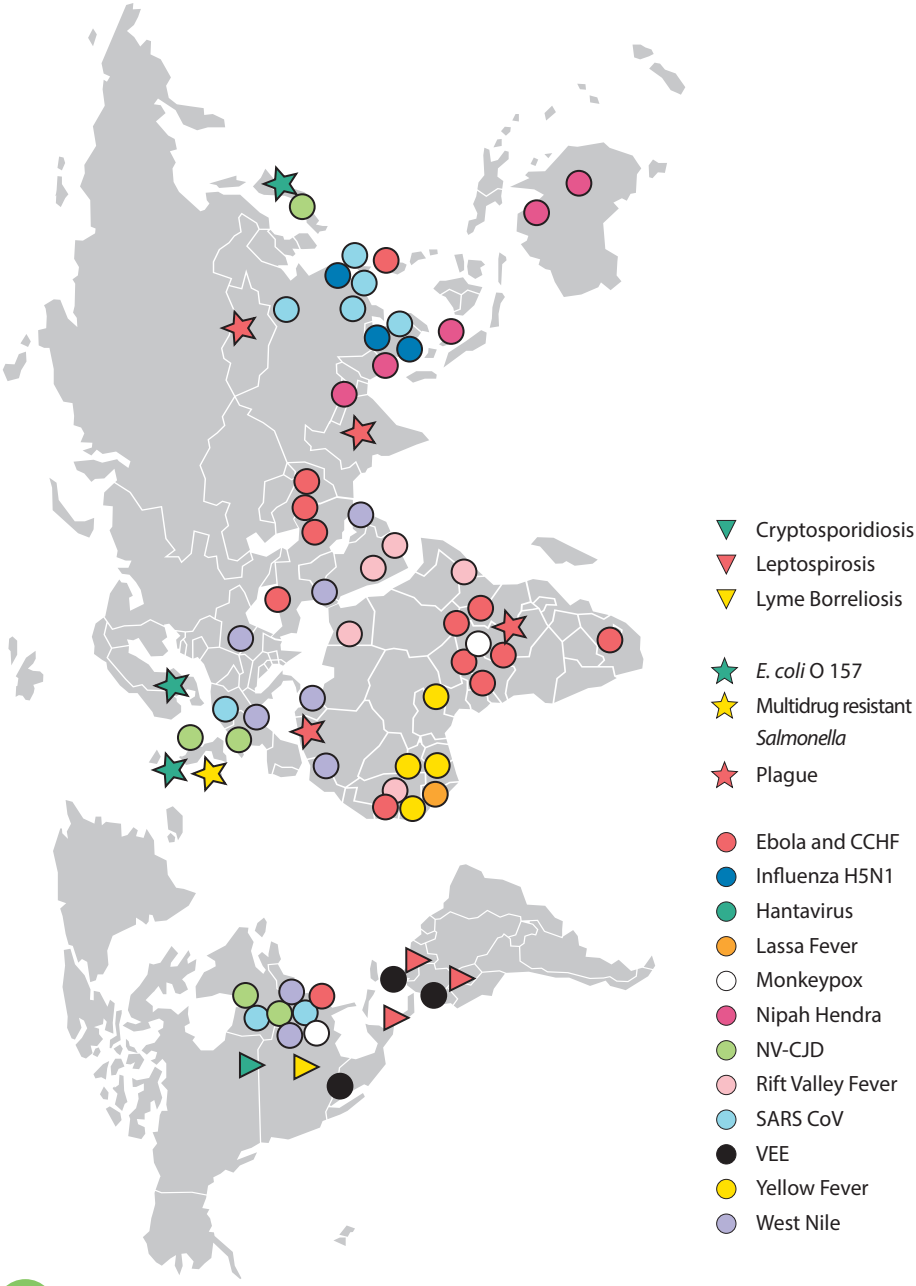
Fact Sheet ❷

Swine flu? MERS? Learning about emerging infectious diseases is important

2.1 Pay attention to information on emerging infectious diseases

The Ebola outbreak in West Africa in 2014-2015 and the MERS epidemic in Korea in 2015 confirmed that infectious diseases in one region can spread to any other country, and that Korea is no exception; thus, interest in emerging infectious diseases has increased. The map in Figure 9.3 indicates that new infectious diseases may appear and some nearly eradicated diseases may reappear; therefore, we must pay

Figure 9.3 **Global distribution of emerging or re-emerging infectious diseases**
(Modified from Heymann D et al [12])



attention to news about infectious diseases from health authorities. In particular, it is advisable to avoid visiting rgions where emerging or re-emerging infectious diseases are known to be present or to visit such regions after obtaining and carefully considering information about preventive measures.

2.2 Safe overseas travel requires at least one month of pre-trip preparation

When planning overseas travel, it is necessary to plan to travel safely based on a global map of infectious diseases. If possible, refrain from visiting regions where emerging infectious diseases are known to be present; if you must travel to such areas, consult with medical specialists about appropriate preventive measures.

Depending on the situation in each region, vaccination can be helpful, but the normal immune response to vaccines takes about 2-4 weeks to take effect. Therefore, if you are planning to travel overseas, visit the overseas travelers' clinic or an infectious disease clinic at least 1 month in advance to receive counseling and vaccination services (Table 9.1). For some infectious diseases, vaccines have not been developed; in such cases (e.g., malaria), taking preventive medication is necessary.

Table 9.1 **Immunizations recommended for overseas travelers by the Korean Society of Infectious Diseases** (Adapted from Korean Society of Infectious Diseases [13])

Types of vaccines	Vaccination-required regions	Characteristics of high-risk travelers	Notes
Immunization is needed for entry			
Yellow fever	Yellow fever endemic regions in Africa and South America that require proof of yellow fever vaccination Request to Korean National Medical Center or quarantine station by 10 days before arrival		1 dose every 10 years
Meningococcus	By 10 days before arrival to Saudi Arabia for pilgrimage		1 dose, combined vaccine every 5 years
Immunization generally needed to travel developing countries			
Hepatitis A	All developing countries	All non-immune travelers (especially under 30)	2 doses (0, 6-12 months)
Typhoid	India, Pakistan, Bangladesh, Nepal, Indonesia, the Philippines, Papua New Guinea	People traveling for more than 2 weeks, or traveling in the countryside	1 dose every 2 years
Meningococcus	Central African nations, Saudi Arabia	Missionaries or medical service teams	1 dose, revaccination after 5 years
Chickenpox	All developing countries	Some non-immune travelers under 30	Antibody test necessary; 2 doses (0, 1-2 months)
Measles, rubella, mumps	All developing countries	Some non-immune travelers between 20 and 30	No antibody test necessary; single dose
Rabies	South America, Mexico, Asia	Researchers of animal studies, people traveling in the countryside for more than 1 month, or volunteers	3 doses
Yellow fever	Yellow fever endemic areas in Africa and South and Central America	Jungle explorers	Single dose, request to Korean National Institute of Health or quarantine station
Polio	India, Pakistan, Afghanistan, Uzbekistan, Tajikistan, African region including Nigeria	Adults under 40, countryside travelers	Single dose
Influenza	The southern hemisphere	High-risk groups for influenza traveling in the summer	Single dose
Additional vaccination for non-sightseeing travel			
Tick-borne encephalitis	Russia, Eastern Europe	Travelers staying in the forest during the summer	No vaccine available in Korea
Cholera		Volunteers at a refugee shelter	Inactivated oral vaccine (Dukoral) preferred
Immunity test or immunization due to traveling			
Refer to the standard immunization table			

Fact Sheet ❸

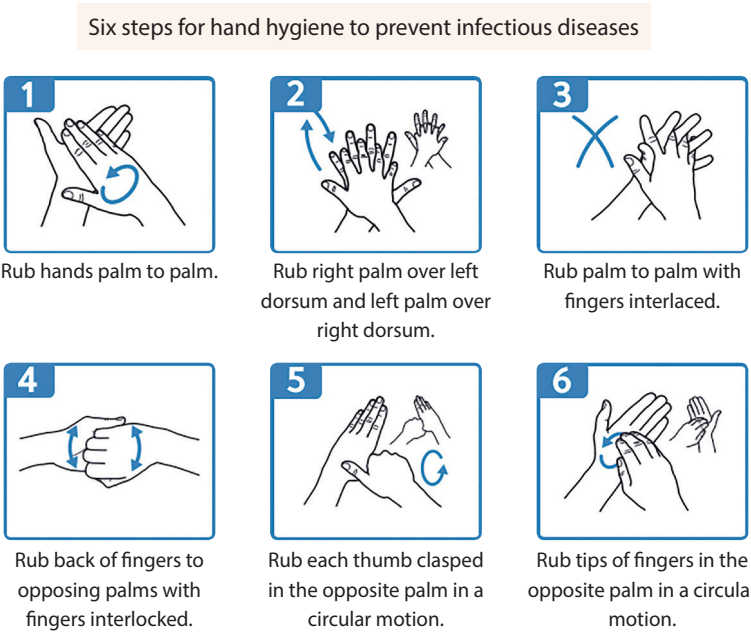
Adhering to prevention practices for infectious diseases is the number-one component of health etiquette!

3.1 Hand hygiene: The first step for preventing infections

Hand hygiene can prevent one-third to half of respiratory infections, including influenza; epidemic eye infections; and food poisoning and enteritis accompanied by diarrhea [14].

This is because germs or viruses from the environment around us or infected people can be transmitted through our hands. Therefore, hand hygiene is the first step for caring for other people. Before and after cooking and eating, after going out, after using the restroom, and after coughing and sneezing, we must conscientiously observe hand hygiene for our own health and for that of others (Fig. 9.4).

Figure 9.4 **Proper way of washing one's hands** (Adapted from Korea Centers for Disease Control and Prevention [15])

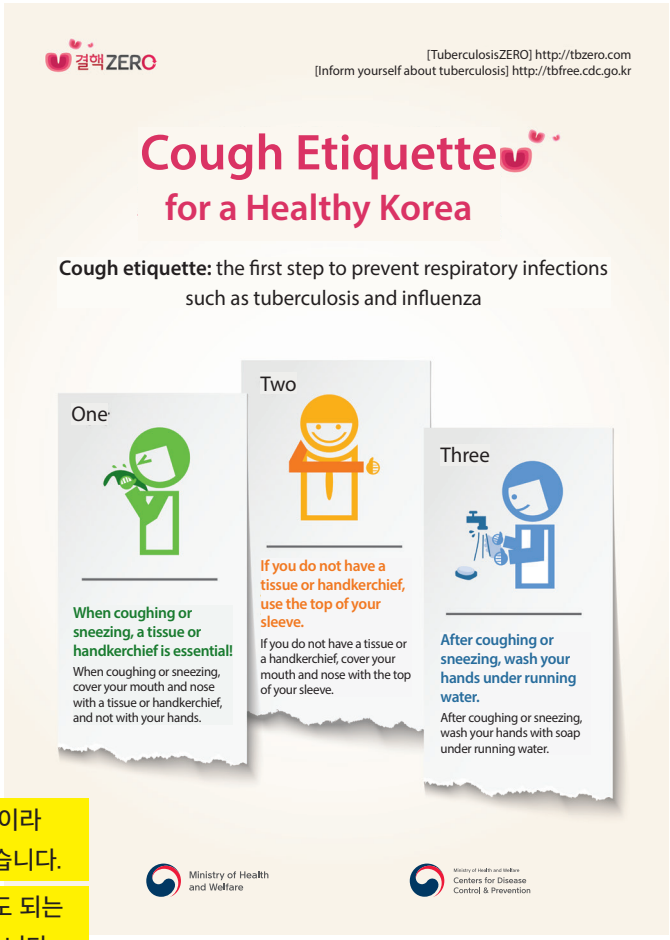


3.2 Those with symptoms of a respiratory infection, such as cough, runny nose, or fever should adhere to cough etiquette

Respiratory infectious diseases such as influenza or MERS can be transmitted through the respiratory organs as infected people cough and release the virus into the air via droplets, or through their hands or environmental contamination with the virus. Therefore, people with symptoms of a respiratory infection must be careful when coughing, so that viruses or germs do not spread into the air or the environment. People who show symptoms of a respiratory infection

need to avoid going out or visiting crowded places and should wear masks. When coughing, people should cover their mouth with a tissue or handkerchief, and their face with the top of their sleeve. In addition, they should wash their hands often in order to keep the virus on their hands from spreading to other people (Fig. 9.5).

Figure 9.5 **Adhere to cough etiquette** (Adapted from Korea Centers for Disease Control and Prevention [16])



포스터 자체가 예전 버전이라 정부기관 로고가 바뀌었습니다.

포스터를 임의로 수정해도 되는지 확인이 필요할 것 같습니다.

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Contributing organizations and associations:

» The Korean Society of Infectious Diseases

Korean Society of Occupational & Environmental Medicine

Korea Occupational Safety & Health Agency

Contributing experts:

» Kyung Taek Rim, Occupational Safety & Health Research Institute, Korea Occupational Safety & Health Agency

Ten Guidelines for a Healthy Life

10

Avoiding Excessive Exposure to Mobile Devices

Jung-Seok Choi, Department of Psychiatry,
Seoul National University College of Medicine,
SMG-SNU Boramae Medical Center

Dai Jin Kim, Department of Psychiatry,
Seoul St. Mary's Hospital, The Catholic University of Korea

Smart use of smart devices

10 Smart use of smart devices

Avoiding Excessive Exposure to Mobile Devices

Summary

◆ Background

Excessive use of smart devices impedes concentration and causes negligent accidents. Exposure to blue light before sleep creates a vicious cycle of fatigue, because it disrupts the circadian rhythm, reducing the quality of sleep and increasing tiredness the next day. This is especially problematic for preschoolers and children.

◆ Purpose

To help people learn how to use smart devices properly, which would help prevent depression and anxiety, reduced quality of sleep, decreased work efficiency, and distress in interpersonal relationship caused by the excessive use of smart devices.

◆ Contents

1. Avoid smartphones while eating

Increased smartphone use means decreased physical activities, and continuous exposure to blue light influences overeating. Let's cultivate a healthy eating habit: no smartphones while eating.

2. Avoid smartphones before sleeping

Excessive light from smartphone screens late at night disrupts the normal circadian rhythm and causes insomnia. Therefore, smartphones should be avoided for 2 hours before going to bed; you should perceive your bed not as a place to use a smartphone, but as a place to sleep.

3. Keep smartphones away from babies

Interaction with the real world is essential for the development and differentiation of the brain in infants and young children. Therefore, when infants and toddlers under age 2 use smartphones, their cognitive development can be negatively affected, as well as their physical development, since smartphone use at an early age causes turtleneck syndrome and scoliosis.

◆ Expected impact

By providing information about the proper place, time, and age for using smartphones, this chapter helps people ensure that they receive adequate mental rest and prevent insomnia. In particular, the points made in this chapter will help ensure the normal cognitive and physical development of infants and young children.

◆ Best practices to follow ◆

1. Avoid smartphones while eating
2. Avoid smartphones before sleeping
3. Keep smartphones away from babies

Fact Sheet ❶

Avoid smartphones while eating

1.1 Do not use a smartphone while eating

When people choose what to eat while using smart devices, there is a strong possibility that they will choose easy and convenient processed food (Fig. 10.1). Studies suggest that people tend to eat more after-meal snacks when they play computer games during meals. According to a report from the Harvard School of Public Health, adolescents who use smart devices, such as a smartphone or tablet, for more than 5 hours a day are twice as likely to consume high-sugar beverages, twice as likely not to engage in any physical activities, and 79% more likely to experience sleep deprivation. As a result, their likelihood of being obese is 43% higher than adolescents who do not use smart devices [1]. Longer and more frequent use of media devices reduces their physical activity, and it makes them more likely to be exposed to food commercials, which in turn makes them more likely to consume snacks or soft drinks at home. More use of media devices means less use of their body; media consumption and computer games have been reported to decrease

children's outdoor activities, playing an important role in increasing the incidence of child obesity [2]. Moreover, these factors make people prone to consume more food than usual even when they are not hungry; according to a previous study, people ate more food when they were absorbed in computer games [3]. Another study reported a correlation between overeating and extended exposure to blue-enriched light from LED screens. Compared to dim light, continuous exposure to blue-enriched light has a greater influence on insulin metabolism and blood sugar levels in the morning and the evening [4]. These factors can cause weight gain; therefore, it is recommended to cultivate the habit of not using your smartphone during meals.

Figure 10.1 **Smartphone use during meals.**

When people choose what to eat while using smart devices, there is a strong possibility that they will choose easy and convenient processed food

Figure 10.2 **Examples of warnings against smartphone use while walking.**
Using a smartphone while walking or driving increases the risk of accidents.

1.2 Set a purpose and particular times for smartphone use

Smartphone use while walking causes accidents all around the world, which gave rise to the new coinage, 'smombie' (smartphone zombie). Moreover, smartphone use while driving is one of the main causes of traffic accidents (Fig. 10.2). More and more pedestrians are getting injured because they were either looking at their smartphones or wearing earphones, making them oblivious to the passing cars nearby [5].

Smart devices make it possible to engage in multitasking, which means processing multiple sources of information simultaneously. Although multitasking is advantageous in that it allows us to take care of many tasks within a short period of time, it has the disadvantage of limiting our thought process to a superficial level. Some studies have reported that people who engage in multitasking excessively might experience decreases in their concentration and memory, and their filtering ability (ability to filter out unimportant pieces of information) might seriously decline [6,7].

Our brain also needs rest. Normally, beta brainwaves prevail when we are in the waking state of consciousness. However, an examination of online gamers showed that their beta waves decreased when they took a break, meaning that their brains were out of balance. In other words, a state of hypoarousal, which includes signs of being 'spaced out,' was detected [8]. To prevent such negative effects, setting a purpose and particular times (e.g., texting, online searching, social networking, business-related tasks, etc.) for each smart device (e.g., tablet, cellphone, or laptop) is recommended. According to a recent study in Korea, proper management and treatment of internet/smartphone addiction improved patients' inhibitory control ability by 2.5 times, and it ameliorated their psychological quality of life by 13.6% [9].

Fact Sheet ❷

Avoid smartphones before sleeping

2.1 No smartphone use within 2 hours before bedtime

Late night is the time for rest; be wary of late-night exposure to excessive light from screens, especially blue light, as it causes disruption of the circadian rhythm, which in turn affects one's health negatively [10].

Insufficient sleep due to the overuse of smartphones and electronic devices can negatively impact the growth and development of children and adolescents. If one uses smart devices after 10:00 PM, the secretion of melatonin (a hormone signaling the brain to fall asleep) is disrupted and the sleep cycle is disturbed, making it difficult to fall asleep. Studies have reported that 2 or more hours of exposure to blue light from tablets suppressed melatonin secretion, and that the arousal effect increased in proportion to the intensity and length of the light exposure [11]. Then,

bodily functions such as the secretion of growth hormones are also more likely to malfunction, and the decrease in the quality of sleep inevitably has an adverse effect on one's social activities and school performance, as one feels drowsy during the day [12]. Therefore, it is best to keep your distance from smart devices for at least 2 hours prior to bedtime. If you must use them, you should download an app that automatically reduces the blue light at night. Taking a hot bath will be helpful if you have difficulty falling asleep, and you need to use your bed not as a place to use smart devices, but as a place to sleep.

2.2 Don't use a smartphone while lying down

Using a smartphone for a long time can cause pain in one's neck and arms, which is a chronic disease of modern people [13,14].

Computer use is related to musculoskeletal disorders. The longer you use a computer, the more likely you are to experience symptoms related to musculoskeletal disorders, such as carpal tunnel syndrome and tendinitis of the wrist and shoulder [15]. It is also certain that other factors—stress, psychological factors, long-time sustained postures, absorption in a task—can cause such musculoskeletal problems. The causal nature of the relationship between smartphone use and musculoskeletal disorders has not been clearly proven; however, it is still important to maintain a good posture when using these devices for a long time. It is also vital to get enough rest and to engage in occasional stretching.

Fact Sheet ❸

Keep smartphones away from babies

3.1 If possible, keep infants and toddlers age 2 and younger away from all smart media

For the development of children's and adolescents' brains, what is essential is not indirect experience via a screen, but interactions in the real world. Additionally, in order to grow healthy with a well-balanced body, it is critical to strengthen the musculoskeletal system and cardiorespiratory function by maintaining proper posture and exercising regularly. Every area of the brain, including the cerebrum, the cerebellum, and the brain stem, grows rapidly from birth to age 2 [16], which is why experts worry about children's use of the internet and electronic devices, especially for those aged 2 and younger. Without proper guidance or direction, using smart devices at such an early age may negatively affect the physical and cognitive development of infants. During childhood, the frontal lobe, which is responsible for self-control and self-regulation, is not fully developed. Instead, what prevails in a child's brain is the reward pathway, which focuses on momentary fun and the experience of a reward; this is why children may encounter difficulties in controlling themselves when using addictive smart devices and video games [17].

According to a 2016 study by the Korean National Information Society Agency, the size of the potential risk group for smartphone overdependence among young children (age 3-9) showed a 5.5% increase compared to the previous year, which was far more drastic than was observed for other age groups [18]. Experts advise that children aged 2 and younger must have restrictions placed on their use of the

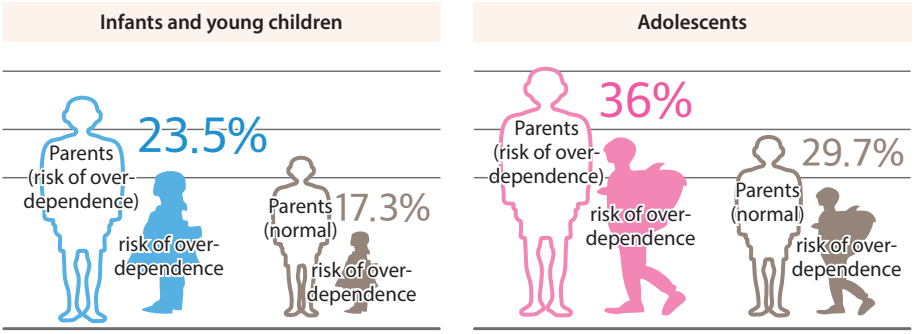
internet and electronic devices to ensure their healthy development [19]. In particular, children and adolescents need to be encouraged to participate in face-to-face interactions and group activities that require cooperation, so that they can develop age-appropriate social skills.

3.2 Parents need to reduce their smartphone usage

The more parents use smart devices, the more their children are likely to do so as well. Studies have demonstrated that when parents are at high risk for smartphone overdependence, their children are more likely to be at high risk as well (Fig. 10.3). It has been reported that while children at a high risk for smartphone overdependence are using smartphones, their nurturers tend to do other things, such as doing housework or resting [20]. If parents hope to limit the duration of their children's smartphone use, they need to make efforts to reduce their own smartphone usage by engaging in physical activities or by playing with their children. Parents need to set an example first by not being absorbed with video games in front of their kids, and by staying away from media devices during meals and at bedtime.

Figure10.3 **Correlation between parents' smartphone use and their children's smartphone overdependence**

(Adapted from Ministry of Science and ICT · National Information Society Agency [20])



Overdependence risk correlation (%)
between parents and children (young children/adolescents) (%)

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Contributing associations and organizations:

» The Korean Society of Medical Informatics (KOSMI)

Korean Academy of Addiction Psychiatry

Contributing experts:

» Hee Man Kim, Department of Gastroenterology, Yonsei University Wonju College of Medicine and Wonju Severance Christian Hospital

Young-Chul Jung, Department of Psychiatry, Yonsei University College of Medicine and Severance Hospital

Index

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