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References: 1. National Institute of Diabetes and Digestive and Kidney Diseases. Know your Blood Sugar Numbers: Use Them to Manage Your Diabetes. <https://www.niddk.nih.gov/health-information/diabetes/overview/managing-diabetes/know-blood-sugar-numbers>. Accessed January 2019. 2. American Diabetes Association. Standards of Medical Care in Diabetes - 2018. Diabetes Care. 2018; 41 (suppl 1) S1:S157 3. Parkin, C. G., Hinnen, D., Keith Campbell, R., Geil, P., Tetrack, D. L., & Polonsky, W. H. (2009). Effective Use of Paired Testing in Type 2 Diabetes. The Diabetes Educator, 35(6), 915–927. <https://doi.org/10.1177/0145721709347601> 4. Harvard School of Public Health. Carbohydrates and Blood Sugar. <https://www.hsph.harvard.edu/nutritionsource/carbohydrates/carbohydrates-and-blood-sugar/>. Accessed January 2019.

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prior to making changes to diet, exercise, or treatment.



Know Your™ Paired Testing

A Personal Approach to Diabetes Management

SERVE YOU



Know Your™ Paired Testing

Know Your™ Paired Testing: Introduction

Did you know that checking your blood sugar level can help you better manage your diabetes and help you to stay healthy?¹ Unfortunately, many people don't check their blood sugar level very often. Some never check at all. Some people have never been taught how to monitor their blood sugar, while others feel discouraged or confused when testing. Often times, these issues lead people to give up on testing.

For people who do check, many don't understand their numbers or don't know what to do with the numbers they see. Some people see their blood sugar numbers as moving up and down for no reason, while others think of their numbers as a grade on a test or a judgment of how well they have done with their meal plan and exercise routine. When you think of blood sugar monitoring in a negative way, it makes it easier to stop testing.



The Know Your™ Numbers brochure can assist you in taking control of your diabetes by learning about your numbers.

Ask your HCP to share it with you when discussing your nutrition plan.

Note to the healthcare provider: The information is intended to familiarize you with the content of the Know Your™ Patient Education Materials. The Know Your™ material is intended for educational purposes only and it is not a substitute for individual advice and diabetes management recommendations. Only healthcare providers directly involved in patient care should use these materials for diabetes education.

The Good News About Diabetes

Any of this sound familiar? If so, we have a unique approach to blood sugar monitoring for you to try called Paired Testing. This means you test your blood sugar level twice—before and again after a meal or activity. When you compare the “pair” of numbers, you can really see how your actions affect your blood sugar level and what you can do to make things better. Paired Testing can give you the facts to make informed and wise decisions, which in turn, will help you feel more confident in managing your diabetes. Our hope is that this approach will take the confusion out of testing and will be an inspiring addition to your diabetes management plan.

Paired Testing is all about home “experiments” with each one lasting 5 days in a row. Each “experiment” will focus on one specific question. The good thing about an “experiment” is that there is no chance of failure. You are just collecting information! Even if you do not like the results, you will always learn something of value. In this booklet, you will find 4 home experiments—some of which you might want to try, some of which you won't. Pick the experiments that are important to you and fit how you manage your diabetes.

Home Experiment #1

Q: How does exercise affect my blood sugar level?

Exercise has many benefits. It can lower blood pressure, improve your mood, help manage your weight, lower your blood sugar level, and more.² However, if you aren't exercising regularly, you may not believe this to be true. So, don't take our word for it; find out for yourself!

In this 5-day experiment, use Paired Testing to find out whether or not exercise can make a difference in your life. Be sure to talk with your healthcare team before starting any exercise program.

▶ **STEP 1.** Select a type of exercise you would be willing to do for 5 days (something like walking, dancing, swimming, or bicycling). It doesn't have to be terribly stressful or tiring, but you should feel like you are working hard enough to almost run out of breath. Any exercise will be fine for now, but you should choose something that you might want to continue after the 5-day experiment.

▶ **STEP 2.** Make sure you practice the activity at the same time each day. If at all possible, do the same amount of exercise each time.

▶ **STEP 3.** Make sure to check your blood sugar level before and right after completing the exercise.

▶ **STEP 4.** Fill out the home experiment form on [page 15](#) each day. Record the date, whether or not you exercised on that day, and if you did your blood sugar level before and right after you exercised. In the last column, subtract your after-exercise blood sugar level from your before-exercise blood sugar level.

▶ **STEP 5.** Figure out your average blood sugar change over the 5 days. To do this, add up all of the numbers in the blood sugar change column, then divide by 5.



Home Experiment #1 Example: Let's meet someone who did this home experiment.

Joe's blood sugar levels had been creeping up over the past year. His doctor suggested that he start walking regularly. Joe doesn't have much time and wasn't sure walking would be worth his while, so Joe decided to try the 5-day experiment.

For his home experiment, Joe:

- Started walking every day after work for 20 minutes
- Kept track of his blood sugar levels on the experiment form

Joe knew it would be easier to stretch out on the couch, but he wanted to give the exercise experiment a fair chance.

Date	Exercised today? (Yes/No)	Before-exercise blood sugar	After-exercise blood sugar	Blood sugar change
5/7	Yes	190	142	-48
5/8	Yes	138	115	-23
5/9	Yes	163	147	-16
5/10	Yes	152	128	-24
5/11	Yes	126	97	-29
Add the numbers in the blood sugar change column, then divide by 5. This is your AVERAGE blood sugar level change. (If you exercised fewer than 5 days, divide by the number of days you exercised instead.)				-28

At the end of the week, the overall impact was clear:

- Joe's blood sugar level went down every time he exercised
- On average, Joe's blood sugar level fell 28 points and was closer to his target range after exercise
- Joe also noticed he had more energy the rest of the evening

Doing this experiment helped Joe feel differently about exercise. He began to look forward to his walks after work. Over time, he began to see his blood sugar level move closer to his target.

Home Experiment #2

Q: Why am I so tired at night?

Do you ever feel more tired than you'd like in the evening? Is a family member worried that you seem too sleepy or groggy in the evening? If this is happening often, it might have something to do with your blood sugar level.² There are things you could do to get your energy back.

In this 5-day experiment, use Paired Testing to find out if being too tired in the evening is related to your blood sugar level.



► **STEP 1.** For the next 5 nights, try to make sure that you have dinner around the same time. Check your blood sugar level right before you start dinner and then 2 hours after your first bite. Set a timer or reminder at the start of your meal to help you remember when to test.

► **STEP 2.** When you do the after-dinner blood sugar test, rate your level of tiredness on a scale from 0 to 10. “0” if you don’t feel tired at all or “10” if you can barely keep your eyes open.

► **STEP 3.** Fill out the home experiment form on [page 16](#) each day. Record the date, your blood sugar level right before and 2 hours after your first bite, and then your level of tiredness 2 hours after dinner. In the last column, subtract your before-dinner blood sugar level from your after-dinner blood sugar level.

Home Experiment #2 Example: Let’s meet someone who did this home experiment.

Every night, Gert would have big plans for the evening. Friends to call, crafts to do, books to read, TV shows to watch, but by 9 PM on most evenings, she could barely keep her eyes open. Could this be age? Stresses in her life? When her diabetes nurse educator suggested that it might be linked to her blood sugar level, she decided to try the 5-day experiment.

For her home experiment, Gert:

- Checked her blood sugar level right before eating each night
- Used a timer or reminder feature on her meter and app, so she wouldn’t forget to check her blood sugar 2 hours after her first bite

Date	Before-dinner blood sugar	After-dinner blood sugar	Tiredness level (0-10)	Blood sugar change
6/2	142	198	9	+56
6/3	119	156	7	+37
6/4	134	202	9	+68
6/5	175	192	3	+17
6/6	114	138	4	+24

At the end of the week, it was clear her blood sugar levels were a big part of the problem:

- On those nights when she was most tired, Gert’s blood sugar levels were the highest after dinner
- Gert found that when she ate more carbs or had dessert, her blood sugar level was higher and she was more tired after dinner

Based on what she learned, Gert decided to repeat the home experiment. This time she cut back on dessert and made sure she ate about the same amount of carbs at dinner each night. It wasn’t easy, but she wanted to see if this would help. Because of these changes, she was feeling more energized in just a few weeks.

Home Experiment #3

Q: How does breakfast affect my blood sugar level?

People with diabetes get a lot of advice about what to eat. With so much information, it can be hard to figure out what is right and what will work for you. The meals and snacks you eat every day affect your blood sugar level in different ways, which can make it hard to know how and where to take action.² With this experiment, you will focus on just your blood sugar level.

In this 5-day experiment, use Paired Testing to find out how breakfast affects your blood sugar level. This home experiment can also be done with lunch and dinner.

► **STEP 1.** For the next 5 days, try to eat your breakfast around the same time each day. Check your blood sugar level right before you start breakfast and then 2 hours after breakfast. Set a timer at the start of your meal to help you remember when to test.

► **STEP 2.** Choose any foods you want for breakfast. Write down the foods you eat and the amount of carbs in each of those foods. You can find carb content by reading the food label, looking in a book with carb counts, or on the Internet.

► **STEP 3.** Fill out the home experiment form on page 17 each day. Record the date, your blood sugar level right before and 2 hours after you eat, and the number of carbs in the meal. In the last column, subtract your before-meal blood sugar level from your after-meal blood sugar level. This number will show you the change in your blood sugar levels.

► **STEP 4.** Figure out your average blood sugar level change over the 5 days. To do this, add up all of the numbers in the blood sugar change column, then divide by 5.



Home Experiment #3 Example: Let's meet someone who did this home experiment.

Stella loved to cook, but when she was diagnosed with diabetes, it became more of a challenge. Her dietitian suggested a 5-day experiment so she could see how certain foods affected her blood sugar level.

For her home experiment, Stella:

- Continued eating her favorite foods for breakfast and wrote down the carbs each day
- Checked her blood sugar level right before and 2 hours after breakfast, then figured out the change in her blood sugar level

Date	Carbohydrates	Before-meal blood sugar	After-meal blood sugar	Blood sugar change
9/12	½ c oatmeal=15, 1 slice toast=15, ½ c OJ=15; Total=45	102	115	+13
9/13	½ c grits=15, 1 slice toast=15, 1 c milk=15; Total=45	124	135	+11
9/14	bagel=60, ½ c OJ=15; Total=75	97	159	+62
9/15	1 c Cheerios™=22, ½ c milk=8, ½ banana=15; Total=45	118	133	+15
9/16	½ c oatmeal=15, 1 slice toast=15; Total=30	91	73	-18
Add the numbers in the blood sugar change column, then divide by 5. This is your AVERAGE blood sugar level change. (If you kept your record for fewer than 5 days, divide by the number of days you did the experiment instead.)				+16.6

At the end of the week, Stella was delighted to see that she was doing a pretty good job with her choices for breakfast most of the time:

- On average, her blood sugar level only increased by approximately 17 points
- Stella's blood sugar level changes were the same when she ate the same amount of carbs

Feeling much freer and more in control, Stella now looks forward to doing experiments with other breakfast foods and her other meals.

Home Experiment #4

Q: What do my favorite snacks really do to my blood sugar level?

Many years ago, diabetes experts advised patients to avoid junk food, sweets, and other tasty treats.² Today you can eat almost anything you want, in moderation. Most people with diabetes hang onto their favorite snacks (such as ice cream, cookies, chocolates, breads): foods they feel guilty or bad about eating, but crave—especially late at night. But how big of a problem are your favorite snacks? This experiment will focus on late-night snacking.

In this 5-day experiment, you will find out how your favorite snacks really affect blood sugar levels.



► **STEP 1.** For the next 5 nights, try to make sure that you have your evening meal around the same time and try to have about the same amount of carbs.

► **STEP 2.** On days 1, 3, and 5, pick a specific time to have your favorite snack—check your blood sugar level right before and then 2 hours after your first bite.

► **STEP 3.** Fill out the home experiment form on [page 18](#) each day. Record the date, your blood sugar level right before your snack (or on days 2 and 4, at the same snack time from days 1, 3 and 5), and your blood sugar level 2 hours after your snack. In the last column, subtract your before-snack blood sugar level from your after-snack blood sugar level.

► **STEP 4.** Figure out your average blood sugar level change for the days you snacked (days 1, 3, and 5) and the days you didn't snack (days 2 and 4).

Home Experiment #4 Example: Let's meet someone who did this home experiment.

Denise worked hard to manage her diabetes and was able to follow a diabetes-friendly diet. At night, though, she found herself craving the ice cream she used to have before bed. Her cravings soon got the better of her and she was back to her late-night ice cream. Instead of just wishing she had more willpower, she decided to try the 5-day home experiment to see if ice cream was affecting her blood sugar level as much as she feared it was.

For her home experiment, Denise:

- Checked her blood sugar level right before and 2 hours after eating a snack each night
- To make her table easier to read, she put an asterisk (*) by each time she ate ice cream

Day	Date	Before-snack blood sugar	After-snack blood sugar	Blood sugar change
1*	4/14	121	162	+41
2	4/15	103	117	+14
3*	4/16	136	186	+50
4	4/17	99	111	+12
5*	4/18	142	173	+31
Add the numbers in the blood sugar change column for days 1, 3, and 5, then divide by 3. This is your SNACKING AVERAGE blood sugar level change.				+40.7
Add the numbers in the blood sugar change column for days 2 and 4, then divide by 2. This is your NON-SNACKING AVERAGE blood sugar level change.				+13

At the end of the week, Denise could see that there was good news and bad news:

- On nights when she wasn't snacking on ice cream, the late-night rise in her blood sugar level was 13 points
- On average, eating ice cream was linked to a blood sugar level rise of nearly 41 points

In total, this meant that ice cream was raising her blood sugar level about 28 points. Denise realized that ice cream raised her blood sugar level much higher than she would like. She wasn't so sure it was worth it. She decided to repeat the 5-day home experiment, but this time she would try a smaller bowl of ice cream—which allowed her to enjoy her favorite snack.

Conclusions

The Paired Testing approach to blood sugar monitoring can be worthwhile and meaningful, especially when it can answer questions that are important to you such as:

- Why your blood sugar level may be going up and down
- How your moods may be related to your blood sugar level
- Whether or not your own actions are making a real difference in your diabetes care
- And so much more

You have seen and hopefully will try a series of Home Experiments that not only answer important questions, but can also help you make better choices for your health in the future.

Try using Paired Testing experiments to assess other important issues such as:

- How stress affects your blood sugar level
- How your favorite drinks influence your blood sugar level
- Why your blood sugar level sometimes seems too high in the morning
- Whether changes in your blood sugar level are making it hard for you to sleep
- How well your medicines are working to control your blood sugar level

The more you know about your blood sugar level and how your actions affect you, the better you can take charge of your diabetes and make wise choices.

Take action

The blank forms on [pages 15 through 18](#) can be used to conduct these new Home Experiments any time you are curious about your readings. Please remember that you don't have to do this alone. Talk with your healthcare provider to develop new Home Experiments that can make a real difference for you.

Remember, you are the most important member of your healthcare team because you address diabetes on a daily basis. It's up to you to understand blood sugar monitoring and to use it to keep yourself healthy. Use the Paired Testing approach to your Home Experiments and take charge of your diabetes.

Frequently Asked Questions

Q: What is Paired Testing?

A: Paired Testing is when you test your blood sugar level before and after a meal or activity. When you compare the "pair" of numbers, you can really see how your actions affect your blood sugar level and what you can do to make things better. The goal of Paired Testing is to ensure that blood sugar monitoring is working for you.³

Q: Why is each experiment 5 days in a row?

A: Life varies from day to day, and blood sugar levels may vary for reasons that are sometimes hard to figure out. But over the course of 5 days, patterns can become very clear. That breakfast bagel, for example, may cause a big rise in your blood sugar level on some days, but a very small rise (or no rise) on another day. Looking at these numbers over 5 days, will help you to see any patterns that occur.

Q: What if you only have a small number of test strips?

A: It is common to receive only 1 or 2 test strips to use each day. But if you check just once every morning, neither you nor your healthcare provider may find the results very useful. Paired Testing helps you to use your test strips more wisely. If you use 2 test strips a day to try a Paired Testing experiment, you are more likely to get some information you can actually use. Of course, always check with your healthcare provider first to make sure that he or she is okay with this approach.

Q: Why am I seeing blood sugar level changes that don't seem to make sense?

A: Even when you eat the same amount of carbs, sometimes the change in your blood sugar level may vary with different foods or how they are prepared. The amount of fiber or fat in food can also change how quickly your body is able to turn carbs into blood sugar. For example, oatmeal and whole wheat bread are high in fiber, so your blood sugar may rise more slowly while other foods may have the opposite effect.² So keep experimenting!



Try It Yourself

The “Exercise” Home Experiment (#1) Form

Date	Exercised today? (Yes/No)	Before-exercise blood sugar	After-exercise blood sugar	Blood sugar change
Add the numbers in the blood sugar change column, then divide by 5. This is your AVERAGE blood sugar level change. (If you exercised fewer than 5 days, divide by the number of days you exercised instead.)				

Making sense of your home experiment results

Don't see your numbers dropping after exercise? If you are exercising shortly after a meal, it may be hard to see the effects of exercise (since the food may be elevating your blood sugar level) Repeat the home experiment, but try exercising at a different time of day.²



Try It Yourself

The “Tired At Night” Home Experiment (#2) Form

Date	Before-dinner blood sugar	After-dinner blood sugar	Tiredness level (0-10)	Blood sugar change

Making sense of your home experiment results

Compare the 2 evenings when your level of tiredness was at its greatest and the 2 evenings when it was at its lowest. When comparing the evenings, you may notice that the numbers in the blood sugar change column are higher on those evenings when you were the most tired.

Your after-dinner blood sugar levels should not be more than 50 points higher than your before-dinner levels.² If this is happening on most days, try this home experiment again with a few changes:

- You may want to try something different at dinner for a few nights, such as a smaller meal or a meal lower in carbs.
- Take a walk or try some other exercise after dinner

If you are still tired at night and don't see any link between your blood sugar levels after dinner, speak to a health care professional to uncover what is causing this symptom. Don't forget to bring your experiment form for your health care professional to analyze.

Try It Yourself

The “Breakfast” Home Experiment (#3) Form

Date	Carbohydrates	Before-meal blood sugar	After-meal blood sugar	Blood sugar change
Add the numbers in the blood sugar change column, then divide by 5. This is your AVERAGE blood sugar level change. (If you kept your record for fewer than 5 days, divide by the number of days you did the experiment instead.)				

Making sense of your home experiment results

- With the average blood sugar level change, you can see how breakfast is affecting your blood sugar
- With the day-to-day blood sugar level changes, you can see how different amounts of carbs affect your blood sugar

If your average blood sugar level change is less than 50, great! Your before-meal and after-meal blood sugar levels should be about the same. If your average change is greater than 50, this may be a problem and you may want to bring this up the next time you see your healthcare provider.²

Now, compare the amount of carbs you ate on the mornings when your blood sugar level changes were the smallest with those mornings when your blood sugar level changes were the largest. You may see that there are bigger jumps in your blood sugar levels when you eat more carbs. If some of those blood sugar level changes are fairly large (especially if they are greater than 50 points), you might want to make some changes in the amount of carbs you have at breakfast.

Try It Yourself

The “Favorite Snack” Home Experiment (#4) Form

Day	Date	Before-snack blood sugar	After-snack blood sugar	Blood sugar change
Add the numbers in the blood sugar change column for days 1, 3, and 5, then divide by 3. This is your SNACKING AVERAGE blood sugar level change.				
Add the numbers in the blood sugar change column for days 2 and 4, then divide by 2. This is your NON-SNACKING AVERAGE blood sugar level change.				

Making sense of your home experiment results

Subtract the average blood sugar level change on non-snacking days from the average blood sugar level change on snacking days. You will then be able to see how much your blood sugar level is changing as a result of your snack. You can use this information to decide if your snack is worth the cost of a higher blood sugar level. In general, a blood sugar level rise of 50 points or higher is probably too high.² If this is happening, you may want to try this home experiment again, but with a different snack.

